



STS  
Encounters

Research papers from DASTS

Volume 15 • Issue 2 • 2023

## The Mixed Blessings of an Iterative Design Strategy

A case study of the handling of user representations

Torben Elgaard Jensen

Professor, TANTLab, Department of Culture and Learning, Aalborg University

Ann-Sofie Thorsen

Research Assistant, TANTLab, Department of Culture and Learning, Aalborg University

STS Encounters is published by the Danish Association for Science and Technology Studies (DASTS). The aim of the journal is to publish high quality STS research, support collaboration in the Danish STS community and contribute to the recognition of Danish STS nationally and internationally.



[www.dasts.dk](http://www.dasts.dk)

ISSN: 1904-4372

# The Mixed Blessings of an Iterative Design Strategy

## A case study of the handling of user representations

Torben Elgaard Jensen  
Ann-Sofie Thorsen

### Abstract

*In design research, it is widely accepted that an 'incremental build' or iterative style of development will allow users to offer feedback at key points in the design process, therefore, creating a more user-oriented type of design. This paper presents a case that complicates and challenges this view. Based on a 12-month ethnographic field study of a design team, we argue that certain aspects of the iterative organization of design work may in fact impede the objective of incorporating user-feedback into the design process. The article explains this surprising finding by tracing how a variety of material and rhetorical representations of users were handled and incorporated by a design team. It explores how different prevailing agendas facilitated the adoption and rejection of user representations, and it reflects on the role played by the design team's efforts to speed up the development process by using so-called out-of-the-box features – pieces of ready-made third-party software.*

### Keywords

Design process, iterative design, user-centered design, design ethnography, user representation, design methodology.

### Introduction

The relationship between designers and users is a complicated affair. Not only is the relation between designers and users a key issue in every single project; the relationship has also been subject to quite staggering historical changes. Hyysalo et al. (2016a) tell the story of the designer-user relation with a point of departure in the rise of mass production in the 1920s. At that time the designers of cars and other mass-market products found themselves separated from users by a series of intermediaries, such as the production department, the sales department, and local car dealers. All these new intermediaries created the risk that car designers would be out of touch with the users and their needs. Responding to the growing gap between designers and users, the car industry invented consumer research as an attempt to recreate a connection and information flow between the world of users and the world of designers. In the decades that followed, a series of additional liaison disciplines and methods were invented, all with the purpose of generating knowledge about the users that could be fed back to the designers. The new disciplines included ergonomics, focus group interviews, market research, and much more. The rise of mass-production thus gave rise to an entire supporting industry of methods and tools for measuring, tracking, and investigating consumers.

If the world of design is a world densely populated with mediations between users and designers, then the specific material and rhetorical forms of these mediations must matter a great deal to the design process. In this vein, many authors in the field of STS have scrutinized the rhetorical and material devices that are used to translate and convey users' needs, abilities, and desires into the context of designers' work (Woolgar 1990; Akrich 1992, 1995; Latour 1996; Oudshoorn & Pinch 2003, Wilkie and Michael 2009). In a recent review of this so-called user representation literature, Hyysalo and Johnson (2016) argue that it has now become evident that user representations flow from a very wide variety of different sources such as user workshops, expert panels, or market surveys. Designers also know about users by being aware of

parallel technologies in their business, often through the technologies they are expected to compete with. Designers have knowledge of product genres and other examples of matured culture, and they gather their own personal experiences and common sense. Designers are parts of professions that represent users in particular ways, for instance by creating professional trends that presumably encapsulate what users might want. Finally, users are mediated or represented to designers through formalized processes such as business models or regulatory demands. In summary, designers receive and face a plethora of user representations, subsequently leading to the practical problems of how to digest, reconcile, and prioritize the many different inputs.

The project described in this article fits the general description of designers having to navigate a sometimes overwhelming and sometimes conflicting stream of user representations. In a broad sense, our article aims to contribute to the user representations literature by analyzing how a team of designers handled the challenge of incorporating a multitude of user representations. Specifically, our article aims to examine what happens to the handling of user representations when designers' work is organized as a series of *iterations*. Iterative organization of design work has a pre-history dating back to at least the 1950s (Larman et al., 2003), but the most significant rise of iterative modes of organizing can be dated to the 1980s and the development of user-oriented design and participatory design (Robertson and Simonson, 2002). These traditions emphasized the importance of engaging users in the design process, and invented formats that would facilitate the articulation of users' knowledge, wishes, and ideas. One of the key vehicles for arranging participatory design was the so-called low fidelity prototypes, for instance, cardboard boxes that users and designers moved and rearranged together to explore and figure out how a particular arrangement of machines on a production floor might influence the workers' ability to collaborate (Ehn & Kyng 1991). In this way, the ambition of co-designing with users emerged together with the practice of using prototypes and other pliable materials to organize an iterative design process that allowed all parties to contribute and

comment as the design product was gradually shaped. Today, user involvement and iteration are widely used and accepted as the most efficient and appropriate way of organizing design processes. *Co-design* and *iteration* are thus core elements of prevailing design philosophies such as participatory design, design thinking, and agile programming. Accounts of good design principles emphasize again and again that working iteratively and engaging users in co-design is the safest route to good results in terms of user-friendliness and user-acceptability (Kolko, 2015). Many projects may not strictly adhere to the more formulaic descriptions of how to organize an iterative process (e.g. Agile Programming), but they nevertheless incorporate significant elements of iteration into their project plans and practices. The project that we analyze in this article thus follows a practice that is widely used: It begins with the development of a 'minimally viable product', which is released to the users, and it continues with a series of 'sprints', each of which debugs and improves the product, leading to a series of updated releases of the software. The aim of this article is to discuss how this type of iterative organization configures the handling of user representations, or more broadly how it sets up the relationship between designers and users.

In the following section we first explain how we conducted the 12-month ethnographic study and what conceptual tools we used to analyze our material. After which, we present our analysis of the design process, where we describe phase by phase how certain types of user representations were favored while others were disfavored. Finally, we discuss the results, and propose an explanation for the surprising fact that iteration, in certain respects, seems to impede rather than facilitate co-design.

## The EMOVE case: Building a new IT system for matching volunteers

The case discussed in this article is drawn from a project called EMOVE

- a 4-year research and development project funded by Innovation Fund Denmark. The EMOVE project included three partners: a small socio-economic firm, which we refer to as MatchDesign, the University of Copenhagen and Aalborg University.

The aim of EMOVE ('Enabling the Matching Of VolunTEers') was to expand on a concept that MatchDesign had successfully developed in the previous three years; they match elderly Danes with newcomers to Denmark, who are in the process of learning Danish. The elderly person and the language student meet regularly in the elderly person's home, talked in Danish, while often developing a mutually beneficial companionship. MatchDesign had matched more than 700 pairs and the company had developed considerable expertise in creating and supporting good matches. The purpose of the EMOVE project was to turn the pioneering efforts of MatchDesign into a broader and more far-reaching business opportunity. The EMOVE partners would gather knowledge about matchmaking in the voluntary sector and use that knowledge to develop a significantly better IT system that could support and facilitate matchmaking processes in a range of different European NGOs.

The authors of this article were the two participants from Aalborg University. Torben Elgaard Jensen was the co-PI on the project and a member of the project management team. Ann-Sofie Thorsen was a full-time research assistant on the project, who worked closely with all the partners in the project, including the designers in MatchDesign who were developing the new system. Thorsen's work included studies of user organizations, usability studies, and the facilitation of workshops. In addition, she conducted a 12-month ethnographic field study of the team of designers at MatchDesign with whom she collaborated closely throughout the project.

## The design process as modes of ordering

In the twelve-month period we followed the design team, it moved through an early phase, where a project description was the most

tangible materialization of the match-making system, to a late phase where a (minimally viable) product was installed in two user organizations and implemented through an elaborate series of so-called onboarding workshops between users and designers.

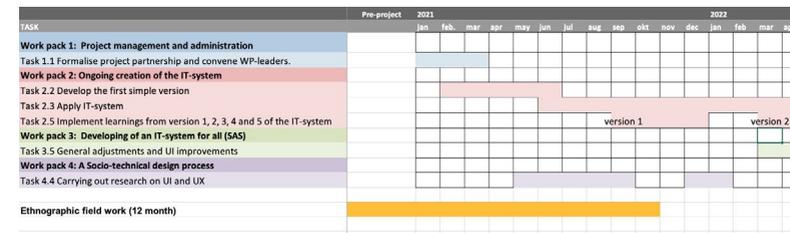


Figure 1. Simplified version of the project Gantt-chart. The ethnographic fieldwork that is the basis for this article was initiated in the pre-project phase and followed the project through the development and implementation of the first version of the system.

Throughout the twelve-month period, we had the opportunity to observe the design team's work, interview people in and around the team, take part in user workshops and meetings, and follow how the system gradually came into being. Based on this material we examined how a variety of user representations were considered, balanced, prioritized, or abandoned by the design team. All this 'handling' of user representations did not take place on one occasion; in fact, nothing could be more misleading than imagining that all user representations were somehow brought to a single meeting to be carefully compared against each other. On the contrary, the key to understanding how the design team handled user representations is to trace the protracted process of design work. User representations came in and out of focus, they were interpreted in different ways, and they were used for different purposes as the system was gradually developed. Some of this 'handling' work took place in formalized meetings with all the EMOVE project partners, some as internal discussions within the design team, and

some at meetings with people who were testing or beginning to use the new system.

In our empirical case, we describe the different phases of the design team's work as three different modes of handling user representations. A mode, we suggest, is not merely a particular time in the project, it is also a different agenda or logic that the design team engages in at that time. Each mode entails an ambition and attempts to move the design project forward in a particular way, and because of this, each mode favors and disfavors certain types of user representations.

Our notion of modes of handling user representations is inspired by the work of STS scholars such as Suchman (1987), Law (1993), Callon (1998), and Mol (2002) who have all described how assemblages of human and non-human actors come together at particular occasions to attempt to do particular kinds of work. Such occasions are framed by how the actors have equipped themselves with particular resources and tools, as well as by the justifications and ideals that the actors draw into their situated interactions. The consequence of these equipped situated interactions is that a particular performance, enactment, or mini-discourse is temporarily brought into being. A key point repeatedly made by Suchman, Law, Callon, and Mol is that situated interactions or performances are not instantiations of a pre-given social order. In their view, there *is* no social order, there are only local ordering attempts: If the assemblage of humans and non-humans is framed, the frame will always be leaking. If the assemblage produces a result, the result will always depend on a 'hinterland' of other relations, and if the assemblage gains prominence and attention it will nevertheless be co-existing with other modes of ordering that will be playing by different rules.

The modes of handling user representations that we depict in the EMOVE project are described in a similar spirit. We think of the modes as phases where the design team, their tools, their user representations, and their understandings of the project are coming together to attempt to push the project forward in a particular way. Generally, this works, but it works in the sense that every mode by necessity approaches

the matters at hand in a particular way while leaving other matters unattended to. These 'others' may then make themselves present elsewhere or at a later point in time. The image we are conveying here is thus not that each phase is like moving up a 'step' whereby everything is carried to the next higher level. Instead, we suggest that phases should be thought of as a sequence of necessarily incomplete attempts at ordering and bringing the project forward.

In the following, we tell the story of the design process by describing the shifting modes of handling user representations that dominated the different phases of the design team's work.

## **Mode 1: Creating attractive visions**

In late 2020, the partners in the EMOVE project came together to formulate the 4-year project description and a funding application that turned out to be successful. In this early stage of the collaboration, the ideas about what users might want or need were expressed as a series of highly appealing features that the EMOVE project promised to deliver. Essentially, the new system would be a vital tool for NGOs that found themselves overburdened with administrative and legal challenges. It would take only one day to install and configure the system. The system would be GDPR compliant. It would be updated continually. It would be accessible and attractive for a broad range of NGOs in Europe, and it would "significantly improve how NGOs recruit and engage with volunteers, including vulnerable groups, while also improving the NGOs' ability to exercise a human touch in the matchmaking process" (EMOVE project description, 2020). Compared to an earlier system that MatchDesign had developed for internal use, the new system would come with significant usability improvements. For example, it would require far fewer 'clicks' to perform specific tasks, and the number of shifts between windows would also be reduced significantly.

The list of appealing 'nice to have' features of the new system, developed by the project partners prior to the project and in its early beginnings, can be read as a series of representations of what users

would want and appreciate. What we find striking, compared to later stages in the process, is the entirely positive and uncontroversial nature of the user representations. As the features are all 'nice to have's none of them indicate dilemmas or give rise to disagreements between the participants. In this mode of handling user representations, the way to move the project forward is thus to assemble a bouquet of attractive visions that can be used to bring together and energize a coalition of project partners as well as an external funder.

## Mode 2: Negotiating co-existence

Once the funding had been secured, MatchDesign set up a team that would develop the new IT system. We will refer to this team as the design team. It consisted of two general man-agers from MatchDesign, a chief technology officer (CTO) who was a programmer, an additional programmer, and a UX specialist.

As we followed how the design team started building the match-making system, we noticed that the primary interest moved towards different kinds of user representations. In the previous stage, the key focus was on user representations in the shape of broadly appealing positive visions. Now, the design team began to evoke more contentious or ambivalent user representations as a part of how they tried to handle design dilemmas.

One example was a situation where the design team had sketched the window that users would use to match volunteers. In the first version, the window juxtaposed the profiles of two people who might potentially be matched, including *all* the information relating to the two people. The design team, however, was quickly skeptical of the window. Based on their immediate personal experience of the window and based on their knowledge of users' responses to similar information-rich windows in other systems, they reasoned that the users would prefer a less 'cluttered' window. The team, therefore, moved on to discuss the option of showing only 'key information' on the profiles along with a link that allowed the user to open a new window with

additional information. The team was hesitant to introduce more links that required clicking because they believed it would irritate the users. To make this argument, they again evoked the user presentations of their own immediate experience in combination with their knowledge of users from other systems. Eventually, the team decided that in this case, the nuisance of an extra click would be preferable to the nuisance of a cluttered window.

As indicated by the example above, the function of user representations in this phase was to articulate dilemmas for the design team. Statements about users' preferences were used to establish discussions about the possible reconciliation of different user concerns competing for the same space, time, or resources. In the specific case, the team handled the dilemma by articulating a choice between two sources of nuisance and by inventing a distinction between 'key information' vs. 'additional information'. In other cases, the design team developed additional distinctions and arguments that would help them strike a balance between different concerns. They decided, for instance, that they were designing for 'the experienced user', which relieved them from the ambition of making all features of the system intuitively clear. They also made distinctions between features that they believed would be broadly useful for the sector as opposed to more specific demands from subgroups of users which the team could then legitimately ignore.

In summary, the prevailing mode of handling user representations in this phase can be described as the ambition of bringing forward sets of user representations that would allow the designers to negotiate questions about co-existence. The project was to balance, choose between, or combine a variety of concerns. Consequently, the design team evoked user representations that were amenable to such discussions. The design team no longer talked about broad elusive visions, such as 'attractive for NGOs across Europe'. Instead, they gave full attention to those user representations that could be discussed and preferably balanced against other user representations. If the user representations were not quite in the right shape ('users want information'), the designers would re-interpret them to make them more suitable for

negotiations and compromise ('users primarily want key information, and preferably also additional information').

### **Mode 3: removing stumbling blocks**

The work of fitting and balancing a variety of concerns into the system lasted roughly six months. After this period, there was a 2-month phase where the system was implemented in two user organizations. In this part of the EMOVE project, the user representations were 'in the flesh' - so to speak. The design team engaged in more than 30 hours of testing and onboarding sessions with the users, during which they received direct comments, praise, and complaints from the users. In our observations of how the design team attended to user representations at this stage, we noticed that the previous focus on balancing acts moved to the background, while the overriding concern was now to identify any kind of obstacle that would jeopardize the onboarding of the user organizations. At this stage, the design team appeared willing to move very quickly and assume costs that they would have been more reluctant to accept in earlier stages. In one situation, the member of the design team who was also the manager of MatchDesign believed that customers were unwilling to pay the full price for the system, so he extended them a discount. In another situation, the programmer and UX designer realized that the emails sent by users through the platform looked 'odd' compared to other standard email programs. Some users considered this to be a significant problem, while others were less concerned. The design team decided that this was an obstacle that needed to be cleared away, so they quickly changed the system to adhere to the prevailing standards.

We have chosen the term 'removing stumbling blocks' to describe the mode of handling user representations that was prevailing at this stage. The key concern for the design team was to get the system up and running, not lose any customers, and focus was on problems that would clearly annoy the users. For this reason, other kinds of input from users slid out of focus, most notably those indicating problems

that could *not* be fixed quickly. These kinds of issues were deferred to the versions and updates of the system that would only happen in the future. Problems that reopened the balancing acts of the earlier stage were also not in focus; their ambition was to get the current system up and running including all the balancing acts and built-in dilemmas that it might have.

### **Issues emerging with the implementation of the system**

In our account of how the system was developed, we have described how the design team's primary mode of handling user representations shifted from creating attractive visions over balancing acts to the removal of stumbling blocks. By talking about modes, we wanted to hold on to the idea that all ordering projects are partial because they co-exist with other ordering projects (Law, 1993). Another way to put this is to say that when the design team developed the project, they pragmatically allocated their attention and efforts to get certain things done in time while pushing other concerns out of focus or deferring them for later. The differences between the center of the design team's attention and various other concerns appeared in the late stage of the project when the system was implemented in two user organizations. In the following, we will describe two issues that were strikingly at odds with the 'shape' of the system that had been created by working through the previously mentioned modes.

The first issue revolved around two very different assumptions about what might motivate the users of the system; two different motivational theories. From the beginning of the project, the design team assumed that people would want to be presented with a clear and prioritized *list of tasks*. Each of these tasks should come with relevant information, and ideally, a user would have managed to clear their task list by the end of the day. This was sometimes referred to as the dream of an 'inbox zero'. Following this inbox zero' motivational

theory, the design team set out to build a system where the task list was a key feature. However, when people in the user organizations encountered the system, a significant number of prospective users complained that the task list turned their work into piecemeal items and deprived them of a meaningful overview of the large group of volunteers that they were working with. In discussions between the EMOVE project partners and within the design team, it gradually became clear that these critical users might be espousing an entirely different motivational theory. The users described their job as taking care of a population of matches. They took pride in knowing that scores of matches were going well, and they focused their efforts on making check-up calls to those matches that were doing less well or initiating new matches. In the view of these users, the work of taking care of the population of matches was, in principle, endless. For this reason, they did not share the dream of a clean inbox. Instead, their sense of meaning and pride in their work was associated with having an overview of the whole population and directing the efforts toward those who needed it the most. Unfortunately, the newly developed system had very little to offer in terms of overview. In fact, the visual presentation of the work as a number of tasks on a task list *reduced* the overview that users had when working with earlier systems. The proponents of the 'caring-for-a-population' motivational theory, therefore, found themselves to be rather frustrated.

The second tension that emerged between the design team and the user organizations could loosely be described as a 'process issue'. In the project plan for the EMOVE project, it was stipulated that the design team would make a functional version of the new system within six months. In the remaining parts of the 4-year project, a new updated version of the system would be developed every three months. To meet these deadlines, the design team skillfully used a number of 'out-of-the-box' features, which enabled them to quickly build a viable system. These were pieces of flexible software, that could be implemented directly into the system, solving otherwise complex design tasks. In the early stages of building the system, the EMOVE project also held

'design workshops' where users described their current matchmaking work, and where general plans for the new system were presented and commented on. However, many users did not understand the implications of the new system until it was implemented in their organizations, at which point they had an experience of being overwhelmed. Some users felt that the development process had gone too fast and that their opportunities to influence the system had been too limited. From the perspective of the user organizations, direct complaints about features of the system were difficult to justify for at least three reasons. First, the fact that the system was implemented in two organizations at once made it difficult for users to argue against the suggestion that a feature they wanted changed might not be useful for someone else. Second, the fact that the system was already implemented made it difficult for users to place the full blame on designers, since it could be argued that the users themselves now had the responsibility for learning how to operate the system in the best possible way. Third, the delivery of the system in a series of updated versions created a situation where criticism of the system could be answered by the promise that issues could be solved in one of the later updates. Such promises could be very specific, but they could also be more elusive, thus deflecting the users' criticism rather than facing it directly.

## Discussion

In discussions about design, there is a prevailing belief that an iterative or 'incremental build' approach to design will go hand in hand with user involvement, which will then lead to design products that are well-aligned with the users' life worlds (Robertson and Simonsen, 2002; Kolko, 2015).

The EMOVE project worked 'by the book' by arranging an iterative design process with a first version after six months followed by a series of updates. However, in the case of EMOVE, iteration was not a safe and certain path to an uncontested and frictionless process of user involvement. Instead, some users complained that the designers

had built the system on assumptions (a motivational theory) that the users did not share, and that the implementation of the system in their organizations placed the users in an overwhelming situation where they lacked the opportunities to discuss the design.

One might argue that the problems in the EMOVE project could have been handled by engaging in even more iterations. The design team might, for instance, have held more design workshops with the users or shown more preliminary versions of their product. However, we would argue that the iteration that was already in the project was a contributing factor to the problems.

The iteration in the EMOVE project was defined in the project plan as a series of short development cycles, each with a deadline and a set of deliverables. This timeline meant that the design team had to move swiftly through modes of ordering, where they first contributed to the broad vision, then made pragmatic balancing decisions, and later removed any immediate obstacles to a quick launch. This fast-paced process enabled and required the design team to move forward constantly rather than engage in time-consuming discussions with users. So, while an iterative approach in principle opened the design process to engagement with users, the practice of defining a series of design iterations, deadlines, and deliveries meant that time and opportunities for user engagement were reduced. It also meant that criticism from users would often be answered by pointing to the updates that would follow later. At times, this was a satisfying answer for the users, but at other times it was experienced as an elusive answer and a kind of deflection. Again, our case indicates that the iterative organization did not necessarily lead to a constructive kind of user orientation.

The pragmatic handling of user representation was a strategy that allowed the design team to handle the project deadlines. Another related strategy or resource was the types of tools the designers were using. A significant part of the system was made from out-of-the-box features, which allowed the design team to meet their deadlines by quickly building a system that was already functional. The prototypes of the EMOVE system thus had a strikingly different character than

the prototypes that are known from traditional participatory design projects. In traditional participatory design, designers preferred so-called low fidelity prototypes; various sorts of pliable materials such as LEGO bricks or cardboard boxes that would allow designers and prospective users to engage in experimentation and discussion *a long time* before the actual and functional system was built. In the EMOVE project, the user organizations were met with a system that already seemed quite finished. This, we suggest, creates a significant shift in the relation between designers and users. Not only does the rapid building make it more difficult for users to engage in design discussions, but it also creates a situation where the designers' sometimes contested assumptions get built into the system very quickly. In the EMOVE project, this appears to have been the case with the design team's 'clean inbox' motivational theory.

The EMOVE case is emphatically not a case of designers that willingly ignore the demands or wishes of users. It is, in fact, quite the contrary. The design team had a strong commitment to user-oriented design and went to great lengths to solicit input from users at onboarding meetings. In that sense, they did user involvement by the book, just as the iterative organization of the project should also be the proper way to facilitate user involvement, according to the prevailing assumptions in the design field. What is interesting about the EMOVE case is, therefore, that significant obstacles to user involvement occurred despite all good efforts and intentions. The source of these obstacles, we suggest, comes into focus when close attention is paid to how the combination of a fast-paced iterative organization and contemporary design tools set the stage for the handling of user representations. When designers are able to quickly build 'viable products', and when users are invited to comment on already implemented systems, the risk is that a process designed to be agile also becomes quite fragile with respect to the users' opportunities to genuinely challenge the designers.

We conclude that the increasingly strong commitment to quick iterations, frequent updates, and agile programming should not be seen as a safe road to user-oriented design and solutions. The rapid

development of workable prototypes may under some conditions be an invitation for dialogue with future users, but it may also in effect be a quick materialization of designers' sometimes wrong assumptions about the users. It may be a 'solution almost ready to be implemented' that overwhelms the users, and may be an object that defies serious criticism because it is sometimes claimed that the next updates will take care of all problems. We therefore recommend more close-up studies of how design ideals are translated into practical ways of handling users and user representations.

## References

- Akrich, M. (1992). The De-description of Technical Objects. In W. Bijker & J. Law (eds) *Shaping Technology/Building Society. Studies in Sociotechnical Change* (pp. 205–24). Cambridge, MA: MIT Press.
- Akrich, M. 1995. User Representations: Practices, Methods and Sociology. In A. Rip, T. J. Misa, & J. Schot (eds) *Managing Technology in Society* (pp. 167–84). London: Cassel Publishers Ltd.
- Callon, M. (1998). Introduction: the embeddedness of economic markets in economics. *The Sociological Review*, 46, 1-57.
- Ehn, P., & Kyng, M. (1991). Cardboard computers: Mocking-it-up or hands-on the future. In J. Greenbaum, & M. Kyng (eds) *Design at work* (pp. 169-195). Boca Raton, FL: CRC Press.
- Hyysalo, S., Elgaard Jensen, T., Oudshoorn, N. (2016a). Introduction to the new production of users. In *The New Production of Users* (pp. 1-42). London: Routledge.
- Hyysalo, S., & Johnson, M. (2016b). User representation: A journey towards conceptual maturation. In S. Hyysalo, T. Elgaard Jensen, & N. Oudshoorn (eds) *The New Production of Users* (pp. 75-100). London: Routledge.
- Kolko, J. (2015). Design thinking comes of age. *Harvard Business Review*, 93, 66.

- Larman, Craig; Basili, Victor R. (June 2003). "Iterative and Incremental Development: A Brief History". *IEEE Computer*. 36 (3): 47–56.
- Latour, B. (1996). *Aramis, or the Love of Technology*. Harvard University Press.
- Law, J. (1993). *Organising modernity: Social ordering and social theory*. John Wiley & Sons.
- Mol, A. (2002). *The body multiple: Ontology in medical practice*. Duke University Press.
- Oudshoorn, N, & Pinch, T. (2003). *How Users Matter: the co-construction of users and technology*. MIT Press.
- Robertson, T., & Simonsen, J. (2012). Challenges and opportunities in contemporary participatory design. *Design Issues*, 28(3), 3-9.
- Suchman, L. A. (1987). *Plans and situated actions: The problem of human-machine communication*. Cambridge University Press.
- Wilkie, A., & Michael, M. (2009). Expectation and mobilisation: Enacting future users. *Science, Technology, & Human Values*, 34(4), 502-522.
- Woolgar, S. (1990). Configuring the user: the case of usability trials. *The Sociological Review*, 38, 58-99.

## Author bios

**Torben Elgaard Jensen** is professor of Science & Technology Studies and leader of the Techno-Anthropology Lab at Aalborg University Copenhagen. His research examines digital transformations, innovation, knowledge construction and user involvement across a range of different contexts.

**Ann-Sofie Thorsen** is a research assistant in the Techno-Anthropology lab and part of the EMOVE project. Her research focuses on processes of user involvement, IT development and design.