Staging co-design processes for self-care technologies
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ABSTRACT
Many new healthcare technologies are currently being implemented in people’s homes in order to facilitate self-care. Socially innovative design is challenging, since it requires an intimate understanding of people’s abilities and daily practices. In this article, we highlight the need to perform field studies in people’s homes and discuss how to stage design processes with people who are actually going to use the self-care technologies – not only end-users, but also other actors, such as relatives, caregivers, and municipality and company staff. Specifically, we describe how challenges associated with inscribing self-care into healthcare technologies can be overcome by staging co-design processes.

Introduction

Being able to turn over at night without needing to call for help from the municipality is very important to me. But having a hospital bed in my home is not an option. Like everyone else, I would like to be able to have a boyfriend over. (Alice, 42 years old, Parkinson’s patient)

To me, being independent means that I am able to tackle everyday things by myself – 100% – and not needing assistance to live a ‘normal’ life. It is okay that I am not able to reach the top shelf in the supermarket, but to get dressed, drive my car, travel, etc., that is self-care to me. (Brian, 26 years old, wheelchair user)

Self-care means that you can perform an act without assistance and that it is up to oneself to decide to ask for assistance. Dignity in relation to a bathing lift means that the assistive technologies are as invisible as possible. (Anne, 44 years old, paralysed from the diaphragm down)

Many new healthcare technologies are currently being implemented in people’s homes, in order to facilitate self-care and independence for disabled and elderly citizens. Socially innovative design can be challenging, since it requires an intimate understanding of people’s abilities and daily practices. But how do designers actually obtain this important knowledge about people’s desires, needs, daily practices, etc.? How can designers obtain the knowledge necessary to design a double bed for the purpose of self-care for people like Alice, or ideas that can enable Brian and Anne to carry out everyday life duties without assistive technologies invading their homes?

In this article, we discuss the need to co-design healthcare technologies with people who will be affected by them. This entails doing field studies in people’s homes, as well as staging design processes that involve not only end-users, but also many other actors, such as relatives, caregivers, and municipality and company staff.

Self-care technologies encompass a wide range of artefacts, such as apps to measure blood pressure, oxygen apparatuses, telemedicine interfaces, modifications in people’s private homes, lift systems, adjustable beds, etc. In this article we focus on the challenges of designing two different self-care technologies: a bed that functions as both a ‘care bed’ for caregivers and a ‘self-care bed’
for the ‘patients’, and a bathing lift that enables disabled people to swim in the sea at public beaches. We argue that designing self-care technologies and artefacts requires focusing on multiple users and situated practices. From our perspective, design processes for self-care technologies are embedded in socio-material relationships and situated practices (Moser 2006), meaning that a researcher must also analyse artefacts relative to multiple users’ practices, needs, and desires. Our argument is that designing a self-care bed, a bathing lift or any other healthcare technology requires staging a co-design process that actively incorporates patients’, persons’ with disabilities, caregivers’, and relatives’ everyday practices.

**Self-care versus healthcare**

Since the mid-2000s, a wide variety of healthcare technologies (in the Danish context these are called welfare technologies) have been implemented in private homes, hospitals, nursing homes, etc., with the triple aim of improving people’s health, improving the quality of care, and reducing costs related to healthcare services (Sørensen 2013). Despite a stated focus on all three elements, economic factors seem to outweigh factors associated with the other two: economic agreements made between the Danish government and municipalities and regions in 2013 included a 500 million Dkk reduction in health sector expenditures attributable to the introduction of healthcare technologies (Regeringen and Regioner 2013). When seeking to understand what is meant by ‘improving people’s health’, these economic constraints are part of the puzzle – whether the desire to improve people’s health relates to the governmental desire to decrease expenditures, or to the desire among members of a democratic society to uphold their fundamental right to take care of themselves (or at least decide when healthcare assistance is needed). In this article, we propose the notion of self-care rather than improving people’s health, since we want to emphasize that the main purpose of healthcare technologies should be to enable self-care.

But how are we to understand self-care and what does it entail? The notion was suggested back in 1955 by Henderson as a way to understand the relationship between nurses and patients (Easton 1993). Orem (1991) and Hall (in George 1980) later refined the notion, with Hall arguing that self-care is to be understood as an ‘interpersonal process, whose goal is increasing patient involvement so that the nurse functions with the patient instead of for, to, at, or against the patient’ (Easton 1993, 385, emphasis in the original). In this definition, the focus is on the practices of nurses, not patients. Orem’s (1991) definition of self-care is less focused on the nursing context: ‘the practice of activities that maturing and mature persons initiate and perform, within time frames, on their own behalf in the interest of maintaining life, healthful functioning, continuing personal development and well-being’ (p. 365). Our understanding of self-care is more aligned with Orem’s (1991) definition; thus, when discussing self-care we do not refer merely to patients, but also to people with different types of disabilities. Self-care is the ability to care for oneself without medical, professional, or other assistance, or at least to decide for oneself when assistance from professionals or healthcare technologies is needed.

Since our argument in this article is that healthcare technologies must be co-designed with the disabled people, it is important to illuminate the perspective of the disabled people’s on self-care and what it means to them. The quotes included here were taken from empirical material gathered for a research project focused on designing a bathing lift to enable disabled people to swim in the sea at a public beach in Denmark. As part of the research project, wheelchair users who were members of a disability organization were asked what self-care meant to them; their views are depicted in Figure 1.

**Designing healthcare technologies for whom?**

A debate over the nature of disability seems to dominate scholarly discussions of self-care (Bury 2000; Finkelstein 2001a, 2001b; Oliver 1990, 2004; Williams 1999): Is disability an expression of oppression, discrimination, inequality, and poverty (the social model), or is disability a medical condition (medicalization)? This debate is important to our discussion because most healthcare technologies seem to
be influenced by medicalization perspective. Healthcare technologies that are designed to ‘fix’ a medical condition typically empower doctors or healthcare staff, not care recipients. An example illustrating this dynamic is the hospital bed, which Alice refused. Like many other healthcare technologies, the script for hospital beds is to improve the physical working environment for caregivers and the beds are designed around their practices, not the practices of the disabled. As shown in Figure 2, the hospital bed is placed in a position that enables caregivers to access a disabled person from both sides of the bed and a table is placed next to the bed to hold care artefacts such as pills, water, napkins, etc.

While healthcare technologies reflecting the medicalization perspective may indeed facilitate caregiving, they do not necessarily facilitate self-care. Thus, in the medicalization perspective, disability is treated as an illness (Oliver 1990) by doctors and healthcare staff whose goal is normality.

However being disabled is not an illness: ‘Disability as a long-term social state is not treatable and is certainly not curable’ (Oliver 1990, 4). In the social model of disability (Oliver 1990, 2004; Thomas 2004) a disabled person’s need for a hospital bed is not just a question of a medical condition, it is a social state. Rather than being an individual’s medical problem, disability is a function of ‘society’s failure to provide appropriate services and adequately ensure the needs of disabled people are fully taken into account in its social organization’ (Oliver 1990, 3).

Thus, designing self-care technologies requires working together with disabled persons, since effective solutions cannot be imposed from outside or from above. Doctors and disabled people must work together to identify and tackle the problems of disability. Working together requires the recognition of each other’s experiences; doctors must attempt to understand why and how disabled people experience disability in the way that they do and disabled people must attempt to understand how doctors are socialized into thinking about disability in particular ways. (Oliver 1990, 5)
The question then becomes, how are doctors and disabled persons to work together? Where are the designers and engineers in Oliver’s and Thomas’ discussions of disability? These two professions also exercise power over disabled persons, through the scripts that are inscribed into healthcare technologies. Thus, when designing healthcare technologies for self-care, it is important not to black-box designers’ role and potential influence. We argue that the processes Oliver (1990) called for can be staged through co-design, where disabled persons (what Star 1991 would call invisible actors) are invited to participate in the design process on equal terms with doctors, healthcare staff and designers with the goal of self-care, not normality.

**A need to stage co-design processes when designing healthcare technologies**

The need to stage co-design processes for healthcare technologies is situated at the intersection of two disciplines: design methodology studies, and science and technology studies (STS). Design methodology studies originated from Bruce Archer’s work on the King’s Fund Bed back in the 1960s (Archer 1965, 1969). Archer argued that design problems were too complex to be solved solely by designers, and that there was a need to approach design in a logical and systematic manner, which meant opening up the design process and incorporating information about user needs (Ghislaine 2001). There were three major design goals for the King’s Fund Bed: (a) to create a hospital bed that would be suitable for use by the majority of patients; (b) to optimize the work positions of healthcare workers; and (c) to implement new systematic design methods. Scholars such as Cross (1980, 1984) and Sanders and Stappers (2008) have further elaborated and modified the design methodologies used for the King’s Fund Bed, but without a specific focus on healthcare design.

Many STS scholars have been interested in healthcare technologies and how they may impact the socio-material relationships between patients/disabled persons/elderly persons, healthcare workers, and work practices. The focus tends to be more on the experiences and practice changes of nurses and specialists associated with telemedicine (Hanlon et al. 2005; Mort, May, and Williams 2003; Oudshoorn, Brouns, and van Oost 2005), and not as much on implications for the design of healthcare technologies. Inspired by Law (1994), Moser (2006) studied locally-situated practices associated with disability, technical aids, and healthcare within broad sets of relationships and arrangements.

**Figure 2.** Picture of hospital bed and bed table in an elderly woman’s private home (Picture: Hanne Lindegaard).
On-location, she observed how ordered practices cumulatively affect everyday life. She concluded that by managing a technology, the disabled demonstrate that they are competent ‘normal’ subjects who control a situation. This capability is associated with and supports other related capacities such as active and independent agency.

In previous work, we have drawn on STS and design methodology studies to explore how assistive technologies designed for institutions change the everyday practices of disabled persons and their relatives when used in their private homes. We found that some technologies end up ‘dis-abling’ actors instead of facilitating independent agency. This creates the opportunity to rethink how assistive technologies are shaped by the inter-play with everyday routines in private homes (Brodersen and Lindegaard 2013).

In this article, we extend our work by discussing how to involve disabled persons and their relatives in co-design processes, and how staging such co-design processes can help designers inscribe self-care into new healthcare technologies. Analytically, we draw on the concepts of domestication and scripts. Drawing on domestication theory (Lie and Sørensen 1996; Silverstone et al. 1989), we describe what happens when disabled people and their relatives incorporate new self-care technologies into their daily practices. This framework enables us to explore whether or not different actors integrate technologies provided by the healthcare system into their everyday lives, and how this process occurs. We specifically focus on micro-relationships in everyday settings, and emphasize how symbolic artefact codes may be personalized and connected to one’s identity and social relationships (Lie and Sørensen 1996; Silverstone et al. 1989). Silverstone et al. (1989) argue that technology domestication can be understood as having four phases: appropriation, objectification, incorporation, and conversion. During appropriation, a technology is introduced into the network – both physically and mentally. Then, through objectification, the healthcare technology is assigned a role and made visible. During incorporation, the artefact is used in daily routines. During the fourth phase, conversion, the actors develop strong artefact–actor relationships with the outside world in terms of identity and values.

We also draw on the notion of scripts (Akrich 1992), since it conceptualizes the connection between design and use. Some healthcare technologies are designed to help caregivers perform their duties (often in institutional settings), while others are designed to enable self-care. Thus, when designing healthcare technologies, the designer not only inscribes the ‘user’ but also the whole network around the ‘user’ and the technology, including the workspace, safety, longevity, etc. Taking a semiotic approach, scholars use the term ‘script’ to describe the roles that technological artefacts play in the heterogeneous networks in which they are situated: ‘Like a film script, technical objects define a framework of action, together with the actors and the space in which they are supposed to act’ (Akrich 1992, 208). Thus, designers inscribe technological content into the new object, and the object’s script is what users confront when they interact with the physical object. In other words, the script can be understood as a message from the designer to the user: it describes the product’s intended use and meaning.

Back in the 1960s, Archer noted the hospital bed design dilemma (i.e. whether to optimize design for professional caregivers, or patients engaged in self-care). Since then several new types of hospital beds have been developed, including the fully and semi-automatic RotoCare and RotoFlex beds. In a recent article (Brodersen, Hansen, and Lindegaard 2015), we discussed the hospital bed design dilemma based on ethnographic studies of implementations of the two beds in nursing homes. We concluded that although self-care seems to be an immediate benefit (e.g. an elderly person is able to get out of bed without assistance), fully automatic beds may be detrimental in the long term because they may expedite physical deterioration (e.g. muscle atrophy). Thus, designing a self-care bed poses challenges not only to designers, but also to healthcare staff, patients, or disabled persons and their relatives. We argue that some of these challenges can be overcome by staging a co-design process that incorporates all implicated actors.

Co-design takes what is known as participatory design one step further by suggesting that technologies, services, and systems should be designed with the intended users. Stemming from the
Scandinavian participatory design tradition, co-design promotes democracy, and change (Bratteteig and Gregory 2001, 63). The basic assumption is that people who are directly or indirectly affected by a technology or system should be empowered to influence it (Namioka and Schuler 1990) because they are the experts on their own lives and experiences. Thus, the focus is on ‘jointly articulating ideas, on playing with concepts, on making and evaluating sketches, on jointly tinkering with mock-ups and prototypes’ (Steen, Kuijt-Evers, and Klok 2007, 11), with a range of relevant actors. However, there is more to co-design than merely understanding actors’ needs and practices; it also involves understanding how to frame and stage design processes and choose co-designers when there are many types of ‘users’.

Scholars from a diverse range of disciplines such as innovation studies, sociology of technology, and design studies have engaged in discussions of users, user-technology relationships and user configurations. They all agree that ‘users’ come in many shapes and sizes (Cowan 1987). Rose (2001, 79) highlighted that some user groups represent other users, raising an ‘interesting issue that users may represent other groups as end-users while at the same time promoting their own interests’. Cowan (1987) followed this line of argument in describing the challenges of identifying users, since different user groups may not agree in terms of who users are and which interests to promote. Thus, the identification of specific individuals or groups of users may affect the extent to which ‘users’ shape the development and use of technologies.

Star (1991) discussed the effects of network inclusion and exclusion, emphasizing that a network is only stable to some actors, and that these actors form, use and maintain the network as a community of practice. For example, she illustrated how one simple request – a hamburger without onions – can lead to chaos at McDonald’s because this request differs from the standard menu. When assembly-line production is used, every burger is identical. Star (1991) concluded:

There is thus a critical difference between stabilization within a network or community of practice, and stabilization between networks, and again critical differences between those for whom networks are stable and those for whom they are not. (p. 43)

In her example, the chaos happened within not only the boundaries of the kitchen, but also herself as the customer. Star’s point is that for those who buy standard menu items at McDonald’s, the process is simple and the network seems stable. However, for those who make special requests, black-boxing cannot be upheld and the network dissolves and appears destabilized. This means that individuals need to accept the ‘standardized’ network or accept being ‘outsiders’.

Hence, deciding whom to invite into the design process is indeed an important part of ‘staging’, which also includes inviting the actors to the stage, and giving them props and a script to help them engage in collective activities and explore future scenarios. It is uncommon when designing healthcare technology that designers invite ‘outsiders’ into the design process, and give them a voice and acknowledge them as actors with expertise about their everyday lives. However, we argue that this is exactly what is needed if the aim is to avoid developing standardized healthcare technologies that are designed for nobody. It is particularly important to avoid having some user groups represent other user groups’ interests in the design process, since this may prove to have fatal consequences for the design process and the artefacts developed.

From a design perspective, ‘staging’ is used to illustrate how an activity is framed in terms of bringing together actors and perspectives in a design process through different material objects and facilitation (Clausen and Yoshinaka 2007). The concept is inspired by the theatre metaphor: certain actors are invited onto the stage to enact existing frames of understanding, to selectively frame problems, solutions and events, and enact circumstances and conditions using props such as design games or mock-ups in their efforts. Staging also encompasses writing a script and directing the actors so they feel secure and guided throughout the performance. Creating reflective conversations and interactions between participants and objects and enacting stories of future use are seen as ‘ways to put the design and arrangement of space, scenery and props, the staging, into play’ (Brandt, Johansson, and Messeter 2005).
Methodology

This article is based on three ethnographic research projects. In the first project, we analysed socio-material relationships in the distribution and use of assistive technologies in Denmark. Our aim was to understand how different users integrate, refuse or negotiate such assistance and artefacts. In the second research project, we studied the implementation process for two robotic beds, RotoCare and RotoFlex, in a Danish municipality. In the third research project, we focused on designing a bathing lift to enable disabled people to swim in the sea at a public beach in Denmark without assistance.

For the ethnographic field studies, we collected empirical material from various sources, including observations and qualitative interviews with multiple informants from patient associations, municipalities, the healthcare system, disabled persons and relatives, and reviewed literature on self-care beds and lift systems. We performed the ethnographic field studies in people’s homes, where we made observations and conducted interviews regarding daily duties and routines. In the research related to the bathing lift, we also performed field studies at an existing, but non-functional bathing lift at a public beach, and at public swimming pools. During the ethnographic field studies, we observed how and when disabled persons, their families and domiciliary caregivers used or did not use the assistive technologies, and whom the technologies actually assisted. We used camera and video techniques to ensure that we gained a detailed understanding of the interactions between the actors and the assistive technologies. Qualitative interviews revealed insights about how the informants perceived their assistive technologies as well as their own accounts for when and how they felt ‘abled or dis-abled’ (Brodersen and Lindegaard 2013; Brodersen, Hansen, and Lindegaard 2015). During the field studies, we collected specific materials such as quotes and pictures from specific situations, which we used later in the design process to stage dialogues in co-design workshops.

The three research projects were all designed from the perspective that disability is ‘society’s failure to provide appropriate services and adequately ensure the needs of disabled people are fully taken into account in its social organization’ (Oliver 1990, 3). Our perspective was and is that in designing healthcare technology, the purpose is not merely to design a device, but also to confront ‘social oppression’ by designing for self-care (Oliver 1992, 110). Does this perspective place our research within the emancipatory research paradigm advocated by Oliver (1992, 1997) and Barnes (1996)? To answer this question, we first need to discuss the paradigm and what it entails. Oliver (1992) argued that the emancipatory research paradigm is about changing the social dynamics of research, by giving control to the researched, not the researcher. Did we turn over control of the research to the disabled persons involved in our research projects? For the first research project on socio-material relationships in the distribution and use of assistive technologies in Denmark, the answer is complicated. Strictly speaking, the answer would be no, because our own interests motivated us to research how different users integrate, refuse or negotiate healthcare technologies and artefacts. Reflecting more deeply, however, the answer could be yes, because our research interests were based on previous interactions with disabled persons who had expressed frustration over need to negotiate with municipalities and healthcare staff about which technologies they needed and wanted to use in their daily lives. For the research project on the implementation process for the RotoCare and RotoFlex beds in a Danish municipality, the answer is also complicated. It may seem as though the answer would be yes, since the study was requested by the health and safety group in the municipality that wanted to create a safer environment for the healthcare workers and facilitate a process whereby elderly people could get in and out of bed without assistance. However, according to Oliver (1992, 111): ‘The issue then for the emancipatory research paradigm is not how to empower people but, once people have decided to empower themselves, precisely what research can then do to facilitate this process’. Since the objective was to empower elderly people, and we did not turn over control to them to facilitate the process, the answer would be closer to no. For the research
project related to designing the bathing lift, the answer is yes, because the request came from the bathing lift users, and the solution was co-designed with them, as we illustrate later in this article. Oliver (1997) also raised concerns related to the widespread use of participation and action research approaches to relinquish research control. He argued that such approaches seem to reinforce existing power structures rather than challenge or confront them ... To use a game metaphor, these approaches are concerned with allowing previously excluded groups to be included in the (research) game as it is, whereas emancipatory strategies are concerned about both conceptualizing and creating a different game, where no one is excluded in the first place. (p. 26)

This may very well be the case in action research; however, our argument for staging co-design processes for healthcare technologies is precisely to avoid the exclusion of ‘invisible’ or ‘weak’ actors. Whether the co-designed products or systems (which reflect participants’ needs and imaginations) are based on existing power structures or not is entirely up to the co-designers, and thus not decided by the researchers or designers.

**How to stage co-design processes: narratives with multiple actors**

In the following sections, we present how a design process was staged so that disabled people became co-designers of a bathing lift at a public beach. The narrative illustrates how an association for disabled people was able, due to a staged co-design process, to argue for a specific design solution and successfully apply for funds from the municipality to develop the bathing lift. Following this narrative, we discuss the challenges faced by different actors when beds are not designed to suit the practices of the actors using the beds, and how staging co-design processes could contribute to the development of self-care beds in which multiple users’ everyday practices are inscribed.

**Staging a co-design process to develop a bathing lift**

This research project was initiated in response to a request from the Danish Disability Association. The association had had a bathing lift available for wheelchair users for several years on their private beach North of Copenhagen. When the association approached us, the lift had broken down, and they asked: ‘What would it take to enable wheelchair users to swim in the ocean without help?’ Together with the association and two undergraduate engineering students, we defined the aim of the research: To co-create the best solution to enable wheelchair users to swim in the sea on their own. Key words for the research and the desired solution thus became self-care and dignity. To obtain an understanding of what self-care and dignity meant for the association’s wheelchair users, we conducted ethnographic interviews with association members and observed the challenges and routines associated with their daily lives in their homes. We also observed processes associated with specific situations, for example, swimming in swimming pools (Figure 3).

Based on the knowledge gained from the wheelchair users, we developed four concept solutions that would enable wheelchair users to swim in the ocean without help. We arranged a co-design workshop with four wheelchair users and one representative from the association. The four concepts were discussed in detail, and the ‘co-designers’ created their own concept solution based on elements from the four proposed concept solutions (Figure 4).

Based on the co-designed concept solution, a final solution was developed in detail (e.g., shape, material, etc.) (Figure 5).

With the co-designed solution in hand, the association succeeded in obtaining funds to make a prototype for further testing.

By involving the wheelchair users who are the future users of the bathing lift technology, we succeeded in developing a solution that inscribes their desires, challenges and practices when going
swimming, and thus when the technology is produced and implemented, it is likely to be adopted and thus domesticated.

**How to stage a co-design process to develop self-care beds**

As illustrated in the statement made by Alice in the introduction, designers need to obtain knowledge about disabled or elderly people’s everyday lives in order to develop technologies that are

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**Figure 3.** Studying the process of how wheelchair users swim in swimming pools (Picture: Høst and Jensen 2012).

**Figure 4.** Wheelchair users create their own concept solution during a co-design workshop (Picture: Høst and Jensen 2012).
suited to users’ practices. We argue that in order to gain this kind of knowledge, designers need to stage co-design processes with different actors. This would also contribute to establishing new ‘sets of standards’ (Star 1991). To facilitate such collaborations, designers can arrange a number of co-design workshops in which different actors can share knowledge and help generate new ideas.

We illustrate how this could be done if we were to stage a co-design process with Alice. Ever since Alice was diagnosed with Parkinson’s, it has been important to her to remain self-sufficient and use a minimum number of assistive technologies. One of the main obstacles in her everyday life is changing positions in bed at night. The municipality offered Alice a bariatric trapeze – a triangular device that hung above her double bed – but it ‘was scaring away my new boyfriend. He took it off and I have not mounted it again’. The trapeze was meant to help Alice, but instead the trapeze became an artefact that relegated her to the role of ‘disabled person’ and changed her relationship with her boyfriend. She discussed the problem with the professional therapist from the domiciliary care system: ‘The occupational therapist told me to ask the municipality for a hospital bed with guard rail … but I am not that disabled. I love my bed and do not want to sleep alone for the rest of my life’ (Brodersen and Lindegaard 2013).

Once the designer would understand Alice’s relationship with the bed and the trapeze, they would realize that Alice and her boyfriend had scripted the bed and the trapeze differently that what the designers had inscribed into the artefacts. The bed, trapeze, and rail were inscribed to ‘dis-able’ Alice rather than enable her to engage in self-care. This meant that Alice did not domesticate the artefacts but instead refused them, which again created a situation where Alice had trouble when her boyfriend was not there to assist her. When designing healthcare technologies, it is of utmost importance that designers understand issues like this. Such knowledge could be obtained through workshops in which disabled persons like Alice could be invited to share their experiences and everyday life challenges. Acknowledging disabled people’s knowledge and
designing products with scripts based on actual practices would contribute to domesticating the technologies.

Like everyone else, disabled people are unique – they have different ‘dysfunctions’, needs and desires, and have different definitions of self-care and being self-sufficient. When designing self-care technologies, these differences are very important to capture and acknowledge, as illustrated by the next narrative.

Maria is in her 30s and became a wheelchair user 10 years ago when she was involved in a traffic accident. Since the accident, Maria has required assistance to get out of bed and she receives around-the-clock assistive care. At night when she has to go to the toilet or wants to get out of bed, she has to call for an unknown caregiver to assist her. To avoid this, Maria has searched for assistive technologies that could help her to become more independent. She managed to get a grant to test out a fully automatic bed, the RotoFlex, for 10 months. This bed makes it possible to move from a prone position to a sitting position with the push of a button. With the RotoFlex, Maria was able to get in and out of bed without assistance from caregivers or lift systems. Maria explained:

My movement capability has improved considerably since I got the bed. In the beginning, I found it a bit difficult to move over, but I could use the lift and tie it around my waist in case I lost my balance or something else happened… Or if I did not feel confident because of a sprained shoulder, I used the lift as a safety device. The new bed has changed my situation from continuously getting injured to getting better.

With the capability to get in and out of bed without assistance, Maria began to feel better physically, since her joints were no longer sprained. The RotoFlex bed made it possible for her to live a more ‘normal’ life despite her disability and to take care of herself rather than relying on caregivers to help her get in and out of bed (Brodersen, Hansen and Lindegaard 2015).

In a co-design workshop, Alice and Maria could augment their stories with photos from their homes. The photos might help designers realize that the RotoFlex bed looks out of place because it has steel rods and a steel frame, resembling the beds found in caregiving facilities. Nevertheless, the bed enabled Maria to care for herself and thus the bed became domesticated due to its enabling functions, despite its shape and form. The symbolic meaning of the bed for Maria was entangled with the functions that it provided, giving her the possibility of privacy.

Using photos to facilitate dialogue during co-design workshops during the design of healthcare technologies and artefacts is very effective, because the photos make the context of use very apparent to the designers (Figure 6).

Most often, assistive technologies are designed for institutions such as hospitals and nursing homes; when such technologies are placed in people’s homes, they typically look out of place and strange. For instance, a hospital bed often is placed in the living room (and not the bedroom) due to space constraints, because the disabled or elderly person is going to lay in the bed most of the day and does not want to be isolated in the bedroom, or to avoid disturbing the relatives at night when care is needed. In addition to hospital beds, artefacts such as toilet chairs, lifting systems, etc. all turn home spaces into workspaces for caregivers (Brodersen and Lindegaard 2013).

Introducing these technologies into people’s homes affects not only the disabled or the elderly person, but also his or her relatives. During our research, we visited a family with a 23-year-old physically disabled daughter living at home who needed assistance around the clock. The family wanted to keep their daughter home rather than place her in an institution, requiring the family to rebuild their house in order to accommodate lift systems, create a space for the caregivers when they stayed at night, and a new bathroom with room for assistance. Right from the initial discussions with the municipality’s architect, the parents emphasized the importance of not rebuilding the house to look like ‘an institution’ or a nursing home. Prior to the rebuilding process, the parents had toured other rebuilt houses, and they did not want a script that was ‘cold’, ‘neutral’ and ‘grey’, where the assistive technologies stood out as foreign elements (Figure 7).
The parents wanted a ‘warm’ atmosphere that coordinated with the existing house and decor. They mentioned that the assistive technologies should not be too visible or stand out as ‘add-ons’, but be inscribed as part of the rebuilt house. They searched in magazines to find door frames, trims, lamps, mirrors, curtains, carpets, shelves, etc. that were ‘functional’, but not scripted as standard solutions developed for an institution. It was important that all equipment and artefacts incorporated into their home could be domesticated (Figure 8).

In a co-design workshop, a designer could stage a dialogue among architects, municipality consultants, relatives, and caregivers using word cards and pictures to prompt ideas about how to integrate healthcare technologies into the home as seamlessly as possible and generate new ideas in collaboration.

Figure 6. Example of how pictures can be used to identify and discuss contextual factors (Picture: Hanne Lindegaard).

Figure 7. Example of how assistive technologies have taken over a private bathroom (Picture: Hanne Lindegaard).
This case reveals how the challenges associated with designing a self-care bed involve more than simply designing a bed that enables self-care, but designing a bed that is situated within a network of other healthcare technologies, is suitable for use in private homes (e.g. will fit in standard size rooms), will be adopted by disabled people, their relatives, etc. All of these factors must be considered when designing self-care technologies.

**Concluding remarks**

In this article, we have focused on how to stage co-design processes through dialogue and how to generate ideas and concepts with actors impacted by healthcare technologies through a variety of design games and mock-ups. We have argued for the importance of staging co-design processes early in the design phase in order to ensure domestication of the designed artefact, and thus help the impacted person rather than emphasize their dysfunctions.

Providing assistive technologies to disabled or elderly persons does not automatically mean that the artefacts become domesticated. For caregivers, the hospital bed had been objectified and incorporated into their daily duties as it had been in the hospital context, explaining the central placement of the bed in the room (often the living room), the adjustable table next to the bed and the trapeze above. Alice did not even reach the appropriation stage with the bed because it was designed as a single bed and because the script of the trapeze emphasized her disability. Domestication of an artefact means that the person exhibits a strong socio-material relationship with the artefact in regards to identity and values, as seen in the case of Maria. Her new automatic bed enabled her to engage in self-care because she could manage the technology and demonstrate that she was a competent normal woman who was in control of the situation (Moser 2006).

We also have argued that since designers are inscribing scripts into design processes, it is very important that they invite disabled or elderly persons and their relatives to take part in co-design workshops, as in the bathing lift example. If we want to design new healthcare technologies that are to be domesticated and used as inscribed, co-design processes must be staged.

**Disclosure statement**

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Notes on Contributors

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