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Chapter 15

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Introduction

The powerful rhetoric of the ageing and innovation discourse legitimises a plethora of projects for geron technology design aimed at older adults as users in response to ageing populations and a (perceived) shortage of caregivers (Neven and Peine 2017; Moreira 2017). The three main goals of those efforts are to (1) alleviate the societal consequences of demographic ageing by making care more efficient in order to decrease the pressure on welfare systems, (2) provide a better life for older adults by making care more patient-focused (e.g. by enabling care at the patient's home) and (3) generate economic growth (Neven and Peine 2017). The scope of technological applications which addresses old age ranges from smart home or telehealth systems providing remote care and monitoring, to care robots supporting physical or emotional needs, to connected services and software.

Research has shown that most technology design projects aiming at older adults, are based on assumptions about "the elderly" rather than being grounded in empirically derived insights of ageing and later life, let alone participatory or collaborative approaches of future making (see, e.g. Brownsell et al. 2011; Endter 2016; Fitzpatrick et al. 2015; Fitzsimmons et al. 2011; Hardisty et al. 2011; Lazar et al. 2018; Oudshoorn et al. 2004; Östlund et al. 2015). In contrast, studies analysing technology design for older adults highlight complex issues that go beyond technology and comprise broader organisational, social and emotional challenges and their socio-technical nature (Mutlu and Forlizzi 2008).

In this chapter, we review how older adults come to be configured as users of gerontechnologies, focusing on the design process itself. In other words, we aim at the activities, materialities and processes that co-construct older adults as users even before their use of such technology occurs. We call anyone who is able to make decisions in design processes "designer". This means that "designers" in this regard are not only professional designers but anyone who can conceptualise, construct, change or implement gerontechnologies. These are mostly software developers, engineers, professional product designers but also funding agencies, policymakers, journalists, psychologists or managers.

In applying their *own* – often stereotypical – assumptions about older adults, technology designers shape prospective users and their perceived needs in specific way as "old". Östlund et al. (2015) warn that by using such one-sidedly designed technologies, dependencies may be reinforced. Vines et al. (2015) point to the risk of a reductionist account in configuring people as users:

> While defining the user of a new technology can be beneficial in characterising its use cases, it has been long argued that this comes with the danger that heterogeneous and multifaceted human beings are reductively portrayed only in relation to the systems they use and how they are allowed to use them.
>
> (Vines et al. 2015, p. 2)

The relation between designers' assumptions, resulting technology and prospective users is one of the key topics of Science and Technology Studies (STS), where *configuring the user and the context of use* is considered to be an integral part of the entire technology design process (Akrich 1992, p. 208; Woolgar 1990). "Innovators" have the power to *define* the "preferences, motives, tastes, and competencies of potential users and *inscribe* these views into the technical design of the new product" (Oudshoorn et al. 2004, pp. 31–2, emphasis added). What we are interested in exploring further in this chapter, is *how such inscription processes take place*. We identify five instances in socio-technical system design, such as the scoping of projects or the definition of their problem focus and analyse how specific practices in those instances configure older adults as users of gerontechnologies.

We begin with the idea of socio-material configurations, which considers how humans and technology are figured in relation to each other. Subsequently we discuss how specific instances of technology design, produce particular socio-material configurations of age and ageing and reflect on the broader organisational, social and emotional challenges they pose. Finally, we call for more critical engagement with technology design for older adults by scholars in both STS-inspired socio-gerontechnology and human–computer interaction. We suggest that engaging older adults prior to and during design highlights alternative measures and attributes of success in later life.

Conceptual framework

In order to analyse how ideas about old age, gerontechnology design and its anticipated users configure each other, we propose Suchman's (2007) notion of "sociomaterial configurations" as a way of tracing how people are configured as users of technology. We then build on this to explore the basic assumption for such configurings in gerontechnologies: that technology is a "fix" for ageing as a problem.

Socio-material configurations

Haraway (1997) argued that all language is *figural* and invokes "associations across diverse realms of meaning and practice" (Suchman 2007, p. 227). In her seminal book, Lucy Suchman demonstrates that technologies are "materialized figurations" in that they assemble "stuff and meaning into more and less stable arrangements" (Suchman 2007, p. 227). Such arrangements frame associations of humans and technologies in particular ways. Suchman (2007) encourages us to take Haraway's idea of technology as "materialized figuration" and to consider how persons and technologies are *con*figured, which means figured in relation to each other and also how they might be figured differently, *re*configured.

The concept of *socio-material configuration* as proposed by Suchman draws attention to the *imaginaries* and *materialities* that technologies *join together*. Configuration is understood as "at once action and effect; as a mode of ordering things in relation to one another (Law 1994) and the arrangement of elements in a particular combination that results" (Suchman 2012, p. 49). This means that particular modes of ordering produce particular configurations of heterogeneous associations of humans, machines, ideas, infrastructures, plans, discourses, practices and subsequently produce particular subject- and object-positions. These associations are performative in that these subject- and object-positions come to be enacted through their association. In this sense, Suchman understands configuration as a "device" for studying technologies and the "conjoining of diverse elements and practices of systems design and engineering" (p. 48).

In 1990 Woolgar coined the term "configuring the user" and argued that it is not only technology that is being configured during technology design processes but "users" as well. "The user" came to be constructed as a social category. Woolgar explored the metaphor of machines as text and considered questions of (distributed) agency in human-machine interaction. Similarly, Akrich (1992) described technical objects as "text" which provide users with a "script".

> Designers thus define actors with specific tastes, competences, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science, and economy will evolve in particular ways. A large part of the work of innovators is that of "inscribing" this vision of (or prediction about) the world in the technical content of the new object. I will call the end product of this work a "script" or a "scenario".
>
> (Akrich 1992, p. 208)

The idea of machines as texts or scripts suggests that users have a certain flexibility in interpreting a designer's intention. There is room for "de-scription", meaning that users are free to re-interpret a text (or machine) and alter its inscription (Akrich 1992). So, we have designers as individuals (or teams) "inscribing" certain tastes, competences, motives, political prejudices and individuals as (future)

users reading (or interpreting) their "scripts" (see also Endter 2016). The notion of socio-material configuration extends this idea by arguing that subject-positions such as users are co-constructed and co-constituted in and through configurations; the relationship between users and technology is hence reciprocal and co-constitutive (see, e.g. Orlikowski and Scott 2008). For example, older adults come to be configured as "older users", not as individual actors but through their associations with technology, through their incorporation "into the socio-material assemblage that comprises a functioning machine" (Suchman 2012, p. 56). These configurations include cultural imaginaries about age and ageing as well as material practices of gerontechnology design.

> The effects of figurations, of modes of ordering, "are political in the sense that the specific discourses, images, and normativities that inform practices of figuration can work either to reinscribe existing social orderings or to challenge them".
> (Suchman 2007, p. 228)

For example, in the case of older adults, they are often figured as frail persons, who are in need of support and defined through their deficiencies (Wanka and Gallistl 2018). By understanding design processes and their results as *socio-material (re)configurations* we are asked to question our cultural imaginaries (the collective resources we have to think about the possibilities in the world) and material practices (which inform and are informed by cultural imaginaries). Further, we are asked in which instances of design processes we might "reinscribe existing social orderings" (Suchman 2007, p. 228) through those cultural imaginaries and material practices, and how we might challenge them.

Even though humans and non-humans constitute each other, they do so in different ways. Because people are those who configure socio-material assemblages, designers are responsible for configuring gerontechnologies, "however much we may be simultaneously incorporated into and through them" (Suchman 2007, p. 270). What is necessary is to recover "certain subject-object positionings – even orderings – among persons and artifacts and their consequences" (p. 269). In other words, scholars should pay attention to how machines and persons constitute each other in an asymmetrical manner by considering questions of agency, power and responsibility, as well as the ways in which accountability of specific human actors is located (while simultaneously recognising their own inseparability from socio-material networks).

As a result, many scholars have turned their attention to the practices, doings and actions that form translations and orderings. Such practice-based approaches are interested in processes; in the performances of objects, subjects, practices, ideas, discourses, architectures or plans and their relationships (e.g. Höppner and Urban 2018; Wanka and Gallistl 2018; Manchester and Facer 2016).

The configuration of older adults as technology users is not a linear process nor manifested in a single instance. This is partly because there is a distance between

technology-design and technology-in-use. This includes different instances in which translations of designers and users take place and multiple sites in which geron technologies are configured. In this paper, we consider five such instances in which older adults come to be configured as users of gerontechnologies.

Configuring age and ageing in gerontechnologies: the technological fix

The five instances that we reflect upon in this chapter, all need to be understood in relation to the "grand narrative" about science, technology and ageing (Moreira 2017; Peine et al. 2015) which is based on a comparatively naive understanding of the relation between technology design and the lived realities of older adults (e.g. Joyce et al. 2017). In this view, technology is seen as an inevitable, essentially good and adequate solution to social and political problems. Furthermore, such technology-driven research and design suffers from an innovation bias (Greenhalgh et al. 2013): in many projects funded and legitimised by the "grand narrative" of demographic change, technological innovation is valued higher than proving technology in use.

The ideas and values inherent to the current so-called "sociotechnical imaginary" (Joyce et al. 2017, pp. 917–24; Jasanoff 2015) of "gerontechnology" shape what is considered desirable for older adults. Older people are represented as separate, static entities that pre-exist their interaction with gerontechnologies. They are imagined as homogenous and inherently problematic, as an extensive review of the research literature from Human-Computer Interaction (HCI) shows (Vines et al. 2015): ageing in technology design is dominantly stereotyped as an economic problem on the macro-level as well as a decline in abilities and associated reductions in performance when using technology on a micro-level (ibid.). With this homogenisation, older adults as users come to be represented "as objects whose needs can be mapped and understood rather than as agents who learn about and develop new needs" (Joyce et al. 2017, p. 927). The "user representation" of older people frames them as frail, needy and is deficit-driven; in turn technology is understood as "solution" (e.g. Harper 2006; Moreira 2017; Cozza et al. 2017).

Gerontechnology enabled by this narrative is thereby designed from an implicitly "paternalistic stance" (Peine et al. 2014), in which technology, the addressed users and the resulting use become objectified. "Interaction" between users and technologies comes to be reduced to a dyadic exchange between an idealised technological system and an idealised user, characterised by a set of needs. This understanding diminishes the significance of the immediate context of actions and in particular the circumstances that emerge during the execution of practical action (Heath and vom Lehn 2008, p. 71). To date, most gerontechnology projects are still focused on producing "innovative" digital artefacts rather than geron technology which is embedded in the experiences and practicalities of older people's life-worlds and relationships.

Instances of configuring older adults in technology design

The STS work referenced above suggests that gerontechnologies, like any technologies, are a compound of cultural imaginaries and materialities, which, once in place, easily become stable arrangements. Therefore, the process of designing and especially the imagined role of the anticipated users are of central interest. Technology designers "inscribe" certain tastes, competences, motives, political prejudices into the socio-material arrangements of gerontechnologies. As we have seen, the most fundamental configuration of older adults as *users* is based on the assumption that old age and its implications are problems which can be solved technically.

However, it is important not to misunderstand this process as linear nor manifested in a single instance: user scripts are produced through multiple implicit and explicit negotiations, mediations and instances. Phases of configuration include (1) problem definition, (2) idea generation and conceptualisation, (3) device (re-)design and prototype development, (4) prototype testing and (5) diffusion (e.g. Merkel and Kucharski 2019). Those phases may vary and are iterative. In "Design Thinking" for example, the analysis is divided into the three steps: "observe", "understand" and a form of user representation through so-called "insights" – followed by the classical steps of ideation, prototyping and testing (Valentine et al. 2017). Some methodologies emphasise frameworks for finding design decisions in these phases together with participants (Jarke 2020). Most importantly, such co-design oriented approaches do not start with a pre-defined problem focus but aim to develop a joint understanding of a problem before starting to develop technical solutions. Participatory design research has developed many and different methods for engaging different people into co-design processes. With respect to older adults, these include, for example, cultural probes (Gaver et al. 1999; Jarke and Gerhard 2018), walks (Jarke 2019) or scenario-based design (Neate et al. 2019).

Whether a gerontechnology design project follows such an explicit design methodology or not, the configurations of use and users prove to be more subtle. Even within an explicitly "user-centered" design methodology, stereotypical imaginaries of age and ageing can be upheld or even reproduced. Often, such configurations in design processes rely on seemingly mundane cultural and social factors and are unreflective on their implications from the outset. Sanders and Stappers (2008) identified a dense and important phase at the beginning of each design process, which they call the "fuzzy frontend" of design. In this initial phase – which is often considered not to be part of the design itself – the goal and outcomes of a planned design process are pre-structured. The "fuzzy frontend" is characterised by ambiguity and is somewhat chaotic in nature: methods and tools at hand, technology to work with and "target groups" may be in flow. But then the initial constraint to build a working prototype of a robot within 36 months to present to the funding agency may narrow down many open questions. Although there is a strong demand for so-called "user-centered design", the early stages of

defining a problem and searching for a technological solution are most often not carried out with addressed users.

To understand such mechanisms, we discuss five critical instances of socio-material configurations within gerontechnology design. These instances are not identical with steps proposed in design methodologies such as "Design Thinking". Instead, they highlight dimensions of modes of involvement, time and power, that fundamentally shape the configuration of older adults in gerontechnology design.

Instance 1: The paradox of user involvement

Perhaps surprisingly, the problematic configurings of gerontechnology design are most often based not on a rhetoric of exclusion but – on the contrary – on the involvement of older adults in design. Within the past 20 years, user involvement has become a central feature of design, as, that is, several ISO standards (e.g. 9241–210:2011–01) show. However, despite the widespread notion that needs and practices of older people and their life-worlds are "an indispensable design input" (Östlund et al. 2015) the reductionist understanding of old age in gerontechnologies has remained influential (Wanka and Gallistl 2018; Peine and Moors 2015).

The concept of configuring helps to understand and conceptualise this paradox of user involvement, asking *how*, under which premises and when older adults are involved in gerontechnology design. For example, projects aiming at older adults may lack resources to engage people in their processes so they can actually decide whether a certain trajectory is followed or not (Bischof et al. 2018). While it may be agreed that user participation in the design process is important, most studies do not detail the applied participation methods, as, for example, review studies on "Living Labs" and Smart Home systems for older adults have shown (de Podestá et al. 2018). While such projects may be described as user-centred, users are involved via interviews or focus groups but excluded from decision-making. Future users remain the subject of design interventions and research, rather than partners (or participants). This relates, for example, to the interpretation of results and definitions of desired futures.

Design studies are therefore concerned with the types and implications of user involvement. A fundamental distinction has to be made between observative (user-centred) and participatory applications. While the first type involves users as subjects for requirements or user-experience evaluation, the second type seeks to integrate users as partners in earlier stages of the innovation process and grants them decisive power. Sanders and Stappers (2008) identify the user-centred design approach as a US-driven phenomenon, whereas the participatory approach ('user as partner') has been led by Northern Europeans since the late 1970s (Ehn 1988; Mumford and Henshall 1979). Both of these mutually influencing strands are part of a meta-development taking place since the 1970s, giving people more influence and initiative in research, design and politics. The resulting landscape of user integration paradigms is thus diverse and overlapping. They differ in the ways in which a diversity of knowledges are included, the ways in which different

interests are heard (or silenced) and the distribution of power (e.g. with respect to decision-making) (see further Jarke 2020).

In sum, the agency of older adults within a design project is configured by the user engagement paradigm a project is (implicitly) adapting. Thus, despite the rhetoric of inclusion a de facto exclusion of the lived experience of older adults is possible, depending on which practices of user involvement are anticipated and carried out.

Instance 2: Time and goal regime of projects

The funding of gerontechnology design and/or research (projects) – whether in academia or private enterprise – requires time planning and framing of the undertaking. For example, a design project has to be outlined in scheduled work packages and milestones. Often, there is a strict temporal limit to the researchers' and designers' work due to the timeframe of a funding period or timeframe for completing a qualification. This creates a paradox: project executives often have to set this timeframe before they actually get involved with "real world" situations of use and future users. Although many designers compensate for this with experience, extra hours or the flexibilisation of work packages, the *structure and logic of explicit timeframes* continue to shape subsequent decisions (Bischof 2017, pp. 166–74).

On a practical level, the time and goal regime of projects structures the extensity and intensity of contact with older people, existing communities, or institutional partners as stakeholders. Irritations and open ends, are constitutive for the "fuzzy frontend" of every design process (Sanders and Stappers 2008) but can hardly be held open for a longer period of time. Instead the time and goal regime of projects requires a quick orientation towards a "doable problem" (see later), constant progress and quick results.

The time scale of most project funding does not match the "Eigentime" of creating trust and social bonds required for a participatory relationship with people (cf. Le Dantec and Fox 2015). Longer termed projects in the scale of five or more years, which would benefit from the option to mutually develop and configure between designers and older adults, are rare (cf. Righi et al. 2018). Hence such time regimes reduce possibilities for user involvement, for example, with respect to the types of activities that are possible.

Instead, the widespread popularity of design procedures such as agile development or design thinking underlines a trend to rationalise and standardise the time scale to develop applications even further, as demonstrated through praxeological analysis of such practices (Seitz 2017). This criticism is not aimed at the methods of agile development, scrum DT and so forth per se, which are undoubtedly useful, but at the rhetoric and economics of using them as handy tools to cope with older adults and their life-worlds. The popularity of such design methodologies should not lead to a shortcut of actual engagement with communities and their livelihoods.

Instance 3: Definition of a doable problem

The third configuring instance, we discuss here, is the definition of a "doable problem" (Joyce et al. 2017, pp. 926–27). Following the logic of (computational) technology, designers have to reduce complex contexts and life-worlds into problems that can be split into successive sub-steps (Latour and Hermant 2006, p. 30). Blurry and ambivalent issues such as the negotiation of intimacy between care-giver and care-recipient, have to be translated into well-specified problems and quantifiable "user needs" (Östlund et al. 2005). This reduction of complexity into technologically feasible problems is a key characteristic of any engineering procedure. However, when attending to humans instead of dams or combustion engines, a power imbalance comes into play (Compagna and Kohlbacher 2015): the future users and contexts of use cannot be conceived in their complexity by designers alone.

The efforts to define a technologically feasible problem are directed towards a "single outcome, usually the 'product' that is to be designed" (Whittle 2014, p. 129). Instead of participatory engagement with older adults, research assignments as well as considerations such as methods and materials at hand, carve out the "doable problem". Not infrequently, even the technological solution is defined before the actual design process begins. This is typical for many healthcare robotics projects, where constructing a robot is set as solution even though it is highly questionable whether an autonomous robot would actually be desirable in specific settings (Riek 2017; Bischof 2017). This means that rather than identifying and defining a problem space and problem definition together, designers of gerontechnology often start from an assumed problem and develop solutions for it.

Instance 4: Practices of user involvement throughout design processes

Not only resulting geron technologies materialise cultural imaginaries of age and ageing but so do practices of user involvement. Any co-design practice – ranging from focus groups to prototyping, co-creation or simple evaluation studies – engage and co-construct specific kinds of "user". For considering which subject and object positions are created by which participation practice, three factors are central: (1) the point of time and frequency of involvement in the design process, (2) the degree and participatory methods of involvement and (3) questions of power concerning design decisions. Such considerations relate, for example, to questions of whether participants select from a number of pre-given alternatives, select from self-defined options or even implement self-defined options.

Laboratory studies, for example, are typically carried out at the end of a project, to evaluate the designed gerontechnology with prospective users. Most often, the participating older adults are treated as statistical units, so to speak. Their essential qualification for participation consists of fulfilling a certain biological age and/or accompanying socio-demographic circumstances such as being retired. Their concrete life-world and experiences outside of the laboratory are rarely of interest.

Although the resulting interactions between designers, participants and gerontechnologies in such test settings are observed to be rich and diverse (Bischof 2017) the input for the design is reduced to rather under complex features such as Likert-scales for "acceptance". Neven (2010) shows, for example, how older participants in an evaluation study made their own suggestions or demarcations to the set of needs that was tested, but these played no role in the further design of the technology.

Participatory practices of involvement treat "users as experts of their lifeworld" (Halskov and Hansen 2015, p. 89). When taken seriously, this notion implies an early, deep and continuing engagement with a concrete group of people, often from a mutual social context, throughout the whole design process. Vines et al. (2013) formulated three aspects that are key to participatory design practices involving users: sharing control over design decisions, sharing expertise (e.g. empowering for self-chosen use) and the facilitation of individual, organisational or technological change through the design process – which must not necessarily be limited to its technological outcome. Important are here the kind of methods that are employed in order to allow older participants to critically reflect on their own experiences. Very often, participants find it difficult to articulate (or even know of) their implicit knowledge/experience and ideas for future technologies (Jarke and Gerhard 2018).

Obviously, the second group of practices implies a process which stands in open opposition to methodologies and processes that naturalise older people as "others" (Oudshoorn et al. 2004). While the methods used do not inherently lead to "good" user involvement, the intention and the quality with which the practices are carried out are much more relevant for problematic configurings of older adults as users of gerontechnology.

Instance 5: (Self-)conceptions of older adults as users

The power of configuring old age through design becomes visible when focusing on reactions to the often ageist narratives within gerontechnologies. The reinforced stereotypes of old age (e.g. Harper 2006) do not only limit the designers "understanding of how older people might experience, live with, use and actively shape and design technologies" (Vines et al. 2015, p. 16) but are also echoed in the self-images of older users.

An often-observed reaction of older participants in user tests and other involvement practices is to subscribe to the deficient age configuration (Frennert 2016, p. 93). For example, Franz et al. (2018) found a frequently observed form of impression management involved participants portraying themselves as weak or dependent in order to obtain help or guidance. Quantitative studies found that this low self-perception surrounding technology even occurred after long-term use of that technology (Wild et al. 2012). This observation corresponds with what Neven called a double naturalisation (2011) of ageist assumptions in gerontechnology: the setting creates a certain behaviour of older people, which is taken as a

basis for design, scripted into technology and thus comes to reinforce this ageism. Therefore, designers should keep in mind that frail behaviour does not always match actual technology skill but rather the test setting itself and the accompanying narratives.

Ageist (self-)conceptions of old age and ageing highlight the central importance of what we mean by "configuring the older adult": it illustrates how fundamental aspects of gerontechnology design are deeply embedded in conditions that exceed the limits of a research project. They are not – as some understandings of design methodology wrongly suggest – a checklist of how to design gerontechnology. On the contrary, they call for a consistently reflexive practice that begins with the first "fuzzy" ideas and continues through every step of the process.

Re-configuring age scripts

In the beginning of the chapter, we referred to problematic images and practices of gerontechnology design as a technological fix for old age. In our account of five instances in which gerontechnologies come to be configured, we have highlighted a number of problematic approaches that, because they do not consider the life-worlds of older adults and do not include them as active participants in the design process, fall back on cultural imaginaries of old age and ageing that are based on ideas of deficiencies and decline.

However, the depiction of these critical instances can also inform approaches that take the participation of older adults seriously and challenge stereotypical imaginaries. We can avoid the "Paradox of User Involvement" – leading to pro forma involvement – by negotiating the role participants could and should have in a design project. We can challenge the time scales most project funding suggest and make room and time for creating trust and social bonds within a participatory relationship with older adults. We can thereby discuss and identify the "doable problem" and possible technological solutions together with the addressed users. And we can be very aware of questions of power when involving people in design decisions. Figure 15.1 summarises the five instances discussed (grey circle) and provides examples for a more inclusive gerontechnology design (white circle).

In this way, we can challenge problematic assumptions of gerontechnology as fix for old age and follow a more inclusive methodology. The starting point for this re-configuring of age scripts in gerontechnology (design) is to challenge the notion of older adults as passive users, which are in need of assistance. Instead, there is a rich body of work that understands old age as embodied experience and older adults as able to actively shape sociotechnical worlds (e.g. Moreira 2017; Jarke 2020). The concept of "technogenerians", who "creatively utilize technological artifacts", adapt and even hack them, is a more adequate paradigm to inform the design of gerontechnology. At the centre of this approach stands the insight that "old people" are a diverse group who draw from different lived experiences, local embodiments and meanings (Lehr 2005). Successful gerontechnology design has
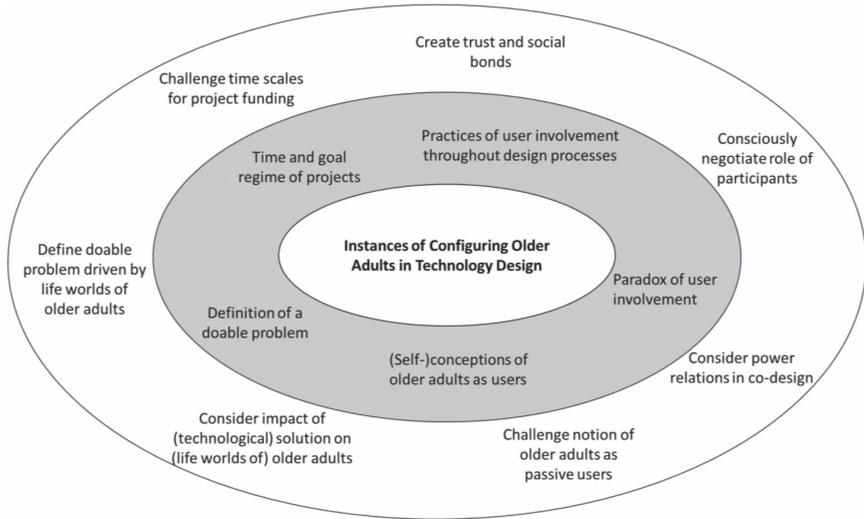
Figure 15.1 Five instances of configuring older adults in technology design (grey circle) and considerations for more inclusive gerontechnology design (white circle)

to take this into account and adopt a reflexive practice, which is aware of the underlying instances critical for the configuring of older adults as users.

Acknowledgement

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