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From niche level innovations to age-friendly homes and neighbourhoods: a multi-level analysis of challenges, barriers and solutions

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ABSTRACT
Age-friendly housing is an envisioned solution to enable people to live longer independently at home, thereby reducing costs of long-term care and responding to the needs and demands of older persons. Although different age-friendly innovations exist, they fail to realise scale beyond the niche level. Based on workshops with stakeholders from different European countries we show that challenges and barriers for scaling-up relate to the unknowns and uncertainties of the culture (age-friendly housing vision), practice (approaches to realise age-friendly housing) and structure (organising and structuring elements) of the age-friendly housing system. Solutions are merely informed by the perspective of the own professional practice and might fail due to their mismatch with other practices and by not considering the resilience of incumbent regimes. Establishing a multi-actor process to start defining the culture, structure and practice might result in a cooperative and distributive effort to realise age-friendly homes and neighbourhoods.

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Introduction

Due to advances in health care and healthier lifestyles, Europeans live longer and in 2060 one in three Europeans will be 60 years or older (United Nations 2017). As a result of this demographic ageing, combined with increasing numbers of chronically ill patients, availability of new and often expensive care products, rising demands for the best available care at any cost, and a required increase of labour force to fulfil all future care tasks, Europe is facing major health and care challenges (e.g. Broerse and Bunders 2010). At the same time, Europe's ageing population is often positioned as a major opportunity for new jobs and growth, referred to as the Silver Economy. This is the economic opportunity that arises from public and consumer expenditures driven by the needs of the population over 50 (European Commission 2017).

In the current dominant discourse, many countries face the challenge of letting people function in their daily environment as long as possible to keep the cost and increasing labour demand for health and care under control. Better age-friendly housing[1] is envisioned to be a solution to help people live longer independently, thereby reducing costs of long term care and responding to the needs and demands of the population over 50 at the same time (WHO 2007). Digital innovations like the Internet of Things, artificial intelligence, big data, machine learning and so forth, provide opportunities to improve the quality of life across the life course, shift health and care services from hospitals to

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homes and neighbourhoods, and/or support social connectedness and creativity in the light of changing family structures. At the same time, these technologies create new risks of digital ageism or digital exclusion. This indicates a parallel shift in both digital technologies and the lived realities of ageing citizens, with greater diversity in welfare and life styles, changing technological competences across all age groups, and more demanding consumers. Our point in this paper is that homes and neighbourhoods are the spaces in which these developments come together, and where digital technologies meet the muddled realities of market forces and everyday lives. This makes the built environment a primary adoption environment in which new technological trends intersect with changing practices and structure of later life.

However, at present the European housing stock and built environment is not fit for purpose to support independence, integrate age-friendly innovations, and enable Europeans to lead healthy, meaningful and active lives across the life course. Over the last decade, many regional, national and European initiatives invested in numerous research and innovation projects to support active and healthy ageing.[2] These initiatives have substantially increased the knowledge relating to technical opportunities and their feasibility. There is extensive knowledge about how new sensor systems, robotics, wearables, infotainment, gaming, et cetera can support independent living and wellbeing. However, many innovative solutions face major barriers when meeting market forces and the muddled complexities of everyday life, which has hindered innovation and broad implementation so far. Apparently these innovations do not become embedded in the dominant cultures, structures and practices of everyday life and thus failed to realise scale beyond the niche level in which they are currently being explored (Sixsmith 2013; Memon et al. 2014).

In this article we address the challenges and barriers in the emerging field of age-friendly housing in order to identify options to shape and manage the future of age-friendly homes and neighbourhoods. To this end we analyse data obtained from a European stakeholder consultation process that was organised by the European Commission in collaboration with the authors in 2016. The consultation aimed at identifying barriers and opportunities that characterise age-friendly housing initiatives and possible actions to realise age-friendly homes and neighbourhoods. Consequently, the research question that guided this consultation process and hence our research is: What are the barriers that hinder current age-friendly housing innovations to break out of their niche? What factors hinder change at the level of regimes, that is the dominant cultures, structures and practices? And what solutions can be identified to shape and manage the future of age-friendly homes and neighbourhoods? In this article we show how consulted stakeholders across countries and sectors aim to shape the (future) age-friendly housing system and the lessons that can be learned by analysing the results from a multi-level perspective.

Theoretical background

The main challenge that the age-friendly housing domain currently faces is the implementation of innovations and initiatives beyond the niche level, that is at the level of dominant existing practices (Sixsmith 2013; Liu et al. 2016). In the ongoing European policy discourse this is widely referred to as the challenge of scaling-up existing pilot projects (European Union 2015). Innovation development in this domain is currently mainly informed by a discourse that frames ageing in negative terms linked to ill-health and disability and many innovations are developed in isolation with no collaboration between different disciplines, commercial, governmental and academic organisations (Memon et al. 2014; Sixsmith 2013). Age-friendly innovations subsequently address frailty, impairment and incapacity, do not match with the needs, desires and situations of older people, and consequently fail to translate into viable products and services that generate positive outcomes for all stakeholders involved. Addressing these issues is difficult and requires fundamental changes in design methodologies, practices and mind-set (Sixsmith 2013; Memon et al. 2014). Moreover, if the age-friendly housing domain aims to achieve the desired gains of letting older people live independently in their preferred environment, changes in current regimes of incumbent health and housing systems are also needed (Memon et al. 2014).

Fundamental changes in socio-technical systems are conceived as transitions and imply re-configurations of system elements, including technologies, policies, markets, user practices, cultural meanings and various forms of knowledge. Changing dominant socio-technical regimes is complex given their resilience to change. A growing body of literature is dealing with the (analysis of) transitions of socio-technical systems and the system innovations these require (e.g. Geels and Schot 2007; Raven 2007). Although most of these studies focus on socio-technical systems in the field of transport (e.g. Geels et al. 2012), energy (e.g. Verbong and Loorbach 2012), agriculture (e.g. Klerkx and Leeuwis 2009) and water and waste management (Van derBrugge, Rotmans, and Loorbach 2005), recently insights from these fields are applied and considered promising in analysing health systems as well (Van Raak 2010; Broerse and Bunders 2010).

A frequently used heuristic tool to analyse dynamics of socio-technical systems and transformation processes of these is the multi-level framework (MLF) (e.g. Rip, Kemp, and Kemp 1998) or the multi-level perspective (MLP) (e.g. Geels 2004). In these frameworks three interrelated levels are distinguished: the macro level of the socio-technical landscape (the exogenous and slow-changing landscape), the meso-level of regimes (constellations of interacting groups with dominant cultures, structures and practices (Loorbach 2007)) and the micro-level of niches (protective spaces for small-scale innovative initiatives). The meso-level of regimes consists of interacting groups of stakeholders that are large, stable and share structures that coordinate action (Geels 2004). It can be defined as: the dominant culture (thinking), structure (organising) and practice (doing) that are embodied by physical and immaterial infrastructures, including regulations, routines, networks and relationships (Loorbach 2007, 20). Structure and culture are 'structuring elements' in the sense of Giddens (1984) and are shaped by the actions in practices of stakeholders that at the same time influence the actions of stakeholders. Meaning that stakeholders interact within the opportunities and constraints of existing cultural and structural elements and, at the same time, act upon and restructure these. In other words, culture and structure enable actions and are the consequence of actions as well (Giddens 1984). Regimes that share certain structuring elements in order to fulfil a societal function, that is, the production of certain goods and providing meaning to these goods, form a wider societal system together, i.e. socio-technical regime or system (e.g. Geels 2004), such as the health system. In other words, linkages between regimes result in alignment of activities between different groups of actors. The actions and interactions within and between actors of different regimes are not necessarily harmonious and conflict and power struggles can take place. Actors have unequal resources and opportunities to realise their aims and as a result unequal power or strength(Geels 2004).

Although socio-technical systems are relatively stable, they are not autonomous entities and influenced by new and emerging science and technologies, societal trends and demands. When they are destabilised by these internal, landscape or niche pressures, a window of opportunity arises that gives niche innovations the potential to break through and become adapted into, or replace, the socio-technical system (e.g. Geels 2002). However, many niche innovations do not survive or scale up. They have to compete with and outperform incumbent regimes or take them over (Smith, Voß, and Grin 2010): their success depends on the extent to which broader circles of powerful actors at the regime level become engaged and mobilise their resources/networks (Späth and Rohracher 2010). Moreover, the dominant presumption with niche innovations is that the diffusion of successful innovations will automatically occur (Simmons, Fajans, and Ghiron 2007; Broerse and Bunders 2010). Although this can be the case, the majority of innovations aiming to transform health systems do not result in impact at large scale and/or fold back after financial support stops (Broerse and Bunders 2010). By understanding the mechanisms and dynamics of a socio-technical system, barriers, including those that are systemic in nature, which hinder development and implementation of innovation can be identified (Kloet et al. 2013). For our case this implies that understanding the mechanisms and dynamics of the age-friendly housing domain from a multi-level perspective, insight can be obtained which barriers hinder activities of actors, including those that are systemic in nature, and if strategies proposed to overcome these barriers take into account the dominant structures and practices of the socio-technical systems.

Methodology

To gain insight in challenges and barriers that hinder current age-friendly housing innovations to break out of their niche, and to identify opportunities and strategies to overcome these barriers, we conducted a consultation process comprising ten interconnected workshops, staged in seven different European countries between April and October 2016. We aimed at organising events that reflected national expertise, innovations, initiatives and resources to obtain a broad range of views concerning challenges, barriers and strategies to overcome these barriers from different stakeholders engaged in age-friendly housing activities at national and/or regional level.

In selecting workshop locations and methods, we applied purposive sampling. More specifically, we partnered with local, national organisations in our network that co-sponsored and co-created these events. In selecting the partners, we made sure that each of them brought a specific expertise to the table that would become the focus and angle of the respective workshop (see Table 1). We provided each of the partners with a generic template for the workshop that specified the range of potentially interesting stakeholders based on our own expertise. The national partners were free to articulate this framework based on their specific expertise and contacts. Specific attention was paid to include stakeholders from a variety of networks and initiatives to have a representation that reflected the range of age-friendly initiatives of the country and region were the workshop was held. Table 1 provides an overview of the workshops that were part of the consultation process.

As a consequence of our approach, all workshops were tailored to the specific context of the country and region where the workshop was organised, while also following the same overall design that blended presentations of key initiatives with focus groups addressing key challenges in the domain. To identify solutions to realise age-friendly homes and neighbourhoods, participants were challenged to formulate their desirable future of homes and neighbourhoods in the year 2050. In this way participants were not restricted to merely extrapolations of current trends and stimulated to think out-of-the-box. We used elements central in the approach of vision assessment (Grin and Grunwald 2000) to identify and construct the desirable visions. This approach has shown to be a suitable method to analyse current practices and future directions of research and development in order to identify options to shape and manage emerging technologies (Arentshorst et al. 2015; Roelofsen et al. 2008) and enabled an analysis of assumptions underlying expectations, promises and concerns that guide the actions and interactions of stakeholders.

To enable stakeholders to formulate their challenges, barriers and solutions in-depth, the language of communication during most of the focus groups was the official language of the country where the workshop was organised. As a result, each workshop had different facilitators who translated the obtained results to English in order to analyse the results. To ensure that we

Table 1. Overview of workshops organised.

Date	City & country	Partner organisation	Focus / angle
7 April 2016	Brussels, Belgium	European Commission	Launch event
11–12 May 2016	London, United Kingdom	Innovate UK, NatWest and Lansons	Finance, health & entrepreneurship
26 May 2016	Arnhem, the Netherlands	Foundation Kien & KIVI-Chair Architecture in Health	Small installation companies
16 June 2016	Bilbao, Spain	Tecnalia	Housing, buildings & urban environments
6 July 2016	Barcelona, Spain	Ethical Cities: Urban Innovation Forum	Urban design & inclusiveness
22 September 2016	Utrecht, the Netherlands	Economic Board Utrecht (EBU)	Construction, policy & entrepreneurship
27 September 2016	St. Gallen, Switserland	AAL-forum	Conference sessions
5 October 2016	Odense, Denmark	Copenhagen Institute of Interaction Design (CIID)	Opportunity-based design
19 October 2016	Genk, Belgium	Microsoft Innovation Centres	Health, care homes & ICT
27 October 2016	Warsaw, Poland	Polish National Silver Economy Institute (KIGS)	Silver Economy, smart by design & labels

obtained insights into challenges, barriers and proposed solutions to overcome these barriers, a general script was designed that was the basis for all focus groups. This script was discussed with the facilitators prior to the workshop and adjusted to the specific context of the region where the workshop was held. As a result, the focus groups resulted in different outcomes on a detailed level, although in all workshops we gained insights in the challenge and barriers faced in the region and proposed solutions to overcome these barriers.

All workshops started with presentations of key initiatives to set the scene, whereupon the participants engaged in focus groups of 6–12 persons, led by a facilitator, into a discussion about how desirable future homes and neighbourhoods would look like. Participants were subsequently asked to translate these future scenarios into actions that needed to be taken, in different sectors, in order to make the scenarios a reality, i.e. a back casting analysis. This provided insights in and understanding of both ideas and dimensions of age-friendly homes and neighbourhoods, as well as barriers for innovation together with possible actions to overcome them. More specific issues like financing and relevance of the European dimension were not included as primary questions, to keep the discussion open, but included as more specific questions during the focus groups. The design varied according to the specific focus of the hosting organisation(s) and local practices. Additional information was gathered from background documents and interviews with selected stakeholders for further clarification and detail.

Audio-recordings were made and notes were taken during all workshops and interviews, and together with additional documents analysed with the help of ATLAS.ti. Via thematic and open coding we identified, coded, described and categorised topics in the data obtained (Flick 2009). Although audio-recorded to enable rewinding certain parts of the workshops and interviews, no transcripts could be made within the financial and time constraints of the process. In addition, due to different languages, many notes are based on the translation of an interpreter during the workshops and on translated summaries of the facilitators. While our research might not encompass all challenges and barriers faced in the age-friendly housing domain, we did obtain data saturation regarding the level on which the challenges and barriers were articulated, and the way solutions were formulated to address barriers, meaning that no new information was obtained in the last two-three consecutive workshops.

Placing the results in a MLP framework enabled a contextualised analysis of the articulated challenges and barriers from a multi-level perspective. This delivered a conceptually rich framing of the scaling up challenge in the age-friendly housing domain – specified as the challenge of niche innovations to break through -, which in turn was a basis to identify opportunities (for policy-makers, innovators and others) to support and facilitate the scaling up of age-friendly innovations and initiatives beyond the niche level of pilots, experiments and prototypes.

Results

In all workshops participants articulated the major health and care challenges Europe, their country and/or region is facing combined with the opportunities they envision in addressing these challenges, as the main reason for their professional involvement in the field of age-friendly homes and neighbourhoods, including their participation in the workshop. In other words, the necessity and opportunity of realising (more) age-friendly housing was seen by all participants and they all indicated to face challenges and barriers in making this a reality. Some of the challenges and barriers articulated relate to technical impossibilities and knowledge gaps in developing age-friendly innovations, such as how to provide real-time access to services. However, many participants confirmed that age-friendly innovations already exist and that the real challenges and barriers relate to making these innovations 'business as usual'. As a result, the majority of challenges and barriers articulated relate to the interrelated unknowns and uncertainties of the culture (thinking), practice (doing) and structure (organising) of the (future) age-friendly housing system. How this system will look like is

Table 2. Main identified challenges, barriers and proposed solutions related to the culture, structure and practice of the (future) age-friendly housing regime.

	Culture ⟷	Practice ⟷	Structure
Challenges & Barriers	Lack of shared vision, related common language and definitions result in lack of reference points for change and moving ahead	Communication, co-creation and collaboration across disciplines and boundaries of established sectors Lack of a market	Lack of structuring elements that enable acting in practice, provide structure how to act in practice and to monitor and evaluate. (Risk of) emergence of different indicator systems with partial assessment of age-friendly homes and neighbourhoods and that are not compatible
Proposed solutions	Development of shared vision that frames ageing as an opportunity, that is broad and concise to provide direction and at the same time leaves rooms for initiatives to articulate it further and to adjust it to specific contexts, via a multi-stakeholder consultation process.	Development of new strategies and support tools how to realise cross-sectoral collaboration, including the identification and articulation of needs, desires and demands of age-friendly housing stakeholders. Dedicated information services that provide citizens with information concerning what solutions are available, where they can be obtained/purchased, their price, impact on everyday life and potential property value increase. New financial models to re-channel existing capital and spending power into the age-friendly housing domain and to create functioning markets.	Guidelines, standards, labels and key performance indicators tailored to the age-friendly housing domain that capture the full range of factors that have impact on the health and wellbeing of older persons, and developed and shared by stakeholders involved.

unknown. Some participants (implicitly) envisioned that age-friendly housing innovations will optimise current health and housing systems, others envisioned a completely new system.

Three main, interrelated themes of challenges and barriers can be distinguished: (1) culture: the lack of a common vision, language and definitions that guide the field; (2) practice: the lack of multi-stakeholder approaches to realise age-friendly homes and neighbourhoods and (3) structure: the lack of organising and structuring elements to support this realisation, which are described in more detail in the following sections and summarised in Table 2.

Culture: common vision, language and definitions

One clear challenge and barrier that was articulated in all workshops is that the domain misses guidance by a shared vision and related narratives as reference point for change and moving ahead. Such a joint vision about the future is necessary according to the participants in order to mainstream practices, facilitate knowledge sharing, and overall to provide guidance and orientation, foster collaboration and overcome fragmentations. The semantic discussions that took place in each workshop due to stakeholders participating from different sectors that did not have the same perspective of age-friendly housing and did not talk the same language, illustrated the need for such a vision and corresponding language. It was emphasised that the vision needs to be broad and concise so as to provide direction, while at the same time leaving enough room for initiatives to articulate it further and to adjust it to specific contexts. Although no clear vision was articulated in any of the workshops, elements regarded as important are a holistic perspective, focussing on inclusiveness, multi- / intergenerational living, assistance (of innovations) and comfort. Most participants saw the European Commission as the designated stakeholder to start realising this vision through a multi-stakeholder consultation process.

Based on the shared, or guiding, vision the realisation of a consistent and precise language to talk about the domain could be realised. During all workshops participants consistently highlighted the need to define a 'more positive' discourse around housing, ICTs, health, care and later life. In line with previous research (e.g. Sixsmith 2013; Neven 2010), they remarked that currently the discourse revolves around a negative, often 'ageist' imagery of older people and later life, downplaying the opportunities that ageing involves at personal, societal and economic levels. A non desirable effect of this negative discourse puts older persons at risk to only have later life housing options that one-sidedly focus on problems, illness and disability. In addition, this negative discourse makes it unattractive for consumers to engage in the domain, which is a significant barrier for innovations to break out of their niches. Participants suggested that the domain should revolve around the idea of 'ageing as an opportunity' as 'ageing with options', whereby older Europeans can make informed choices about where and how they want to age, with or without relocating.

Practice: approaches to realise age-friendly homes and neighbourhoods

Regarding the practice (doing) of the age-friendly housing domain, participants indicated that co-creation and establishing collaboration across disciplines and boundaries of established sectors is a prerequisite to realise age-friendly homes and neighbourhoods, while at the same time indicating that this is a major challenge. In the absence of articulated demands, needs and desires from citizens and other relevant stakeholders there are little incentives for involved sectors to produce excellence, resulting in a number of waiting games (e.g. Parandian, Rip, and Te Kulve 2012). Time and again, participants pointed out actions of other sectors as a requirement for the own sector to continue and improve. Frequently articulated examples are construction companies waiting for developers to articulate demands; ICT companies waiting for a standard or platform to emerge; product and service providers to wait for the health sector to clarify the evidence and/or for insurance companies to update reimbursement rules. In addition, we also observed that participants brought arguments forward in which age-friendly innovations would minimally maintain, and most of the times increase, the position and status of a stakeholder's practice. Participants protected (perhaps unconsciously) their status and position and those of stakeholders in the same practice, including discrediting stakeholders of other (competing) practices. As a consequence, different stakeholders are pointing to and waiting for each other. A typical example hereof was encountered during the workshop in Arnhem, the Netherlands (details in Box 1). Here, both sectors framed the opportunity of age-friendly housing in terms of their own professional practice, resulting in statements that their sector is the key player and therefore in the lead, and other sectors should act according to tasks assigned to them. However, this other sector, should first undertake specific action before this can be realised.

Box 1. Framing the opportunity of age-friendly housing in terms of the own professional practice– the case of ICT and Construction.

In the Arnhem workshop 25 smaller ICT and installation companies participated and highlighted changing needs and the provision of flexible solutions as key challenge. This challenge was framed as a challenge for *ICT sectors*. The *construction sector*, on the other hand, was seen as too conservative, with too long time frames, to provide flexible solutions. According to the participants of this workshop it is the task of the ICT sector to make bricks and mortar provided by the construction sector 'dynamic' and 'smarter', such as through the provision of virtual walls. During the Utrecht workshop, a different twist of the same story emerged. Here, participants from the *construction sector* downplayed the challenge for the ICT sector: 'it's what they do anyway', thus not exiting. The true opportunity for change and new business, from their perspective, exists for the construction sector – i.e. in the provision of flexible built environments, such as modular houses, flexible infrastructures and overall a good mix of housing options in the neighbourhood.

Bringing stakeholders from different sectors together during the workshop in Utrecht showed that the true opportunity is a shared one, with both sectors having something to offer and something to gain. Bringing out such mutual opportunities opened eyes regarding the value of looking beyond one's vested interested, and to explore collaborative approaches to realise opportunities together.

Participants indicated that new strategies, i.e. cross-sectoral collaboration, and support to overcome these waiting games is highly desirable. During our consultation process local initiatives demonstrated that such collaborations already exists, but in the niches of pilot projects, experiments or voluntary engagement. Cross-sectoral collaboration remains challenging at the very fundamental level of defining actions across different sectors. Our results show that the age-friendly housing domain involves stakeholder groups that are completely new and/or not 'routinized' beyond the niche level and the level of local pioneers. Social care and health stakeholders are not used to collaborate with construction, for instance, and vice versa, construction companies are not used to include health or ageing issues in their constructions. Likewise, for architects and urban planners it is still unusual to focus on health and care provision in the community. And ICT companies tend to perceive the construction sector to be conservative, and thus not able to provide the flexibility and pace needed to create flexible and smarter environments. Identification and articulation of needs, desires and demands of stakeholders involved in the practices of age-friendly housing is envisioned as a way forward to establish cross-sectoral collaboration and hence a way forward to realise age-friendly homes and neighbourhoods.

Another identified barrier and challenge that hampers collaboration and mainstreaming of the age-friendly housing domain is the lack of a market. At the moment, European citizens are neither able nor willing to act as consumers of age-friendly housing options. The majority, both in and outside social housing, has no access to the options available in the age-friendly housing domain, because they are unaware of their existence, lack basic information about them, have no access to services that can provide them, and/or incentives to buy them. This also prevents citizens to clearly articulate their needs, desires and wishes, and in turn does no stimulate involved sectors to produce excellence. Participants indicated that unless dedicated information services, with clear information about what solutions are available and where, it will be very difficult to re-channel existing capital and spending power into the age-friendly housing domain, or create functioning markets. Participants indicated that new financial models in the sector need to go hand in hand with information provision that make available options transparent in terms of their price, impact on everyday life and potential increase in property value. As a consequence, information and communication to and with citizens needs to become a joint effort. In this way the different perspectives regarding the added value of age-friendly options, their availability and accessibility can be combined, adjusted in time and space, and be disseminated.

Structure: organised and structured ways to proceed

The articulated need for an approach that enables working across disciplines and boundaries of different practices, guided by a common vision and language, also implies the need for structuring elements, such as guidelines, standards, labels and key performance indicators, to enable acting in practice, provide structure how to act in practice and to monitor and evaluate. In other words, participants indicated the need to make elements of the guiding vision measurable in order to determine, monitor and evaluate for example whether a home, or certain element, can be classified as 'age-friendly' and to create standards to ensure that age-friendly innovations are interoperable.

Although the structuring elements were not elaborate in detail, many participants expressed for example the need for indicators and guidelines as concrete tools to implement and evaluate actions. The European, or probably even global, dimension is envisioned essential in this regard, as it enables benchmarking inspiring practices and actions across different regions. Participants stressed that it is important that these guidelines and indicators are tailored to the age-friendly housing domain, and that they are developed and shared by the stakeholders involved, because otherwise there is a risk that each sector will develop its own indicator system for the partial assessment of age-friendly homes and neighbourhoods, such as accessibility standards for new buildings. In accordance with the need for a shared vision, participants indicated that guidelines and indicators should be based on a holistic perspective of the impact of age-friendly housing, capturing the full range of factors

that have impact on the health and wellbeing of older persons. This needs to reach beyond comfort, safety and accessibility factors, to include opportunities for personalised solutions, social connectedness, levels of stimulation, creativity, et cetera.

Regarding financing of the domain, participants pointed to governments as having the main responsibility, however, there also seemed wide agreement that enough financial means are present in current systems. Participants expressed the idea that cross-sectoral collaboration will lead to the availability of financial means and investments. The underlying rationale is that through collaboration of relevant stakeholders the added-value of investing into the age-friendly home domain would become clear, including the potential for economic impact and return on investment. Here, the clear communication of value propositions for different stakeholders, including end-users, to engage in the age-friendly housing domain is key.

Conclusions and discussion

This research identifies and analyses challenges, barriers and potential solutions regarding the realisation of age-friendly homes and neighbourhoods envisioned by stakeholders involved in the age-friendly housing domain. Although stakeholders consulted work across different European countries and sectors, they all would like to see age-friendly, smart, inclusive, empowering homes and neighbourhoods to become a reality across Europe, and face barriers in realising this. A small part of their formulated challenges and barriers relate to technical impossibilities and knowledge gaps, while the majority is the result of unknowns and uncertainties about the interrelated structure and elements of the culture, structure and practice of the (future) age-friendly housing socio-technical system. We show how the lack of a shared and guiding vision (culture), the absence of collaboration across sectors, including the involvement of users (practice), and the lack of shared structuring elements, such as standards, guidelines and incentives (structure), results in innovations and initiatives merely based on insights from the own professional practice and waiting games, i.e. pointing out actions of other stakeholders as a requirement for the own sector to continue and improve.

We observed that many participating stakeholders struggled with thinking beyond current ways of doing and organising and beyond the own professional practice, although we stimulated them to think out-of-the-box by letting them formulate their desirable future of age-friendly housing. Articulated barriers and solutions are mainly formulated from within the professional practice, and attributed to the practices of other stakeholders. As different stakeholder groups, or institutions, have different specialised ways of viewing and addressing problems, i.e. their own practice, it is highly unlikely that their own specialised solution or the sum of solutions from different institutions will result in an adequate solution (Broerse and Bunders 2010). In other words, age-friendly housing innovations and initiatives focus on the own professional practice and most likely fail to scale up due their mismatch with other involved practices and by not considering the resilience of the current housing and health socio-technical system.

According to some stakeholders consulted age-friendly housing innovations will optimise the current health and housing systems, others envision a completely new system. However, regardless the vision of what an age-friendly housing system is or should be, most barriers arise at the interface between the incumbent health and housing socio-technical systems and relate to the combination, integration and/or replacement of knowledge, experiences, practices and structures of both systems, i.e. the culture, structure and practice of the age-friendly housing socio-technical system. Either way, overcoming barriers implies changes in the current day-to-day business of innovation environments, established sectors and regimes, and perhaps the transition towards a new system that is a combination of the current housing and health system.

Towards age-friendly homes and neighbourhoods

The identified need for the development of a shared vision that guides actions in practice in order to direct desirable changes of a socio-technical system is not a new phenomenon. In governance

strategies the development of so-called guiding visions is identified as a central element for this purpose (Späth and Rohracher 2010). The function of visions is to 'deliver orientation for present acting and deciding' (Grin and Grunwald 2000, 179). They function as a 'common language' that guides actions in practice and guides interactions between different stakeholder groups (Grunwald 2004; Mambrey and Tepper 2000). Identification and understanding of the elements that make-up visions offers therefore opportunities to shape or steer actions (Grin and Grunwald 2000). According to Späth and Rohracher (2010) guiding visions play an important role in multi-level transitions in which 'discourses are interlinked in different ways across different geographical scales and levels' because 'they travel across spheres and levels and are used intentionally to co-shape socio-technical change in a multi-level, multi-actor process' (456). However, they also point to the complexity of organising vision building process and the many factors that play a role in realising a socio-technical transition, including many that are beyond control. They analysed how a region develops a guiding vision based on general objectives set at both national and EU-level. Of course, this vision is specific for this region and needs to be tailored to the specific context of other regions in order to function as a guiding vision. Regarding the domain of age-friendly housing this could imply that a general vision identifying elements of the culture, structure and practice at a general (EU-)level for the domain could be the start for countries and regions to develop their own detailed vision, tailored to their specific context, in order to realise age-friendly homes and neighbourhoods with practices that are interoperable to a certain extent.

Stakeholders consulted in this research indicated that the development of a shared vision should be developed by means of a multi-stakeholder process. This begs the question: who is responsible for realising and financing this process? The majority of the participants indicated the European Commission and other governmental institutions as the designated point of departure. In their scaling-up strategy (European Union 2015), the European Commission on the other hand assumes implicitly that stakeholders will organise themselves to develop and realise solutions and hence age-friendly homes and neighbourhoods will become a reality in the near future. Besides these conflicting expectations, insights obtained from previous studies show that diffusion of successful niche innovations is not automatically occurring (Broerse and Bunders 2010; Simmons, Fajans, and Ghiron 2007) and that realising action beyond the own professional practice with the intention to change dominant regimes is complex given their resilience to change (e.g. Kloet et al. 2013). Multi-stakeholder dialogue meetings have shown to be successful tools in the identification and formulation of shared visions and solutions. Moreover, the interactions between stakeholders of various sectors and disciplines in these meetings results often in new insights and collaborations (Huang et al. 2012; Van Merkerk 2007; Robinson 2010; Roelofsen 2011). However, it is also known that realising intentions that are the result of these meetings often fail and/or result in limited changes (Grunwald 2011; Van Merkerk 2007; Roelofsen 2011), most likely due to dominant socio-technical regimes that are too rigid to allow changes (Kloet et al. 2013). Therefore, multi-stakeholder processes should viewed and designed as continual learning processes (Kloet 2011; Roelofsen 2011; Van Merkerk 2007) and have a structural place in emerging science and innovation that aim to produce societal benefits (Arentshorst et al. 2015). Making such a multi-stakeholder process the driving force in the domain of age-friendly housing, facilitated by the European Commission on a general level and by local governments and regions on a more detailed level, might result in a cooperative and distributive effort to realise age-friendly homes and neighbourhoods.

Notes

1. In this paper we use the term 'age-friendly housing' and 'age-friendly homes and neighbourhoods' interchangeably to indicate (future) opportunities of more suitable built homes and environments, taking into account innovations as well as socio-cultural trends in ageing and later life. We use the term 'age-friendly housing domain' to indicate the whole range of stakeholders, innovations and structuring elements involved, including their interactions.

2. Consider, for example, the European Commission's investment of 20 million Euros in a large scale pilot that focuses on 'Smart Living' as part of their Digital Single Market strategy (https://ec.europa.eu/digital-single-market/en/news/communication-digitising-european-industry-reaping-full-benefits-digital-single-market), the establishment of the committee on Active Ageing & Design in 2015 as part of the European Construction Technology Platform (ECTP) (http://www.ectp.org/), and the identification of age-friendly built environments as one of the 10 key opportunities to grow Europe's Silver Economy by the Smart Solver Economy Project (http://www.smartsilvereconomy.eu/silver-economy).

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