

Sustainable Housing Supporting Health and Well-Being [†]

Régis Decorme ¹, Silvia Urra ², Olatz Nicolas ², Carina Dantas ³, Annelore Hermann ⁴, Gustavo Hernández Peñaloza ⁴, Federico Álvarez García ⁴, Aline Ollevier ⁵, M. Charalampos Vassiliou ⁶ and Willeke van Staalduinen ^{7,*}

¹ R2M Solution SAS, Les Galeries de Beaumon, 06330 Roquefort-les-Pins, France; regis.decorme@r2msolution.com

² TECNALIA Research & Innovation, E-48160 Derio, Spain; silvia.urr@tecnalia.com (S.U.); olatz.nicolas@tecnalia.com (O.N.)

³ Caritas Diocesana De Coimbra|SHAFE, Rua D. Francisco D'Almeida, 14-3030-163 Coimbra, Portugal; carinadantas@caritascoimbra.pt

⁴ Grupo de Aplicación de Telecomunicaciones Visuales, Universidad Politécnica de Madrid, Avenida Complutense 30, 28040 Madrid, Spain; ath@gatv.ssr.upm.es (A.H.); ghp@gatv.ssr.upm.es (G.H.P.); fag@gtav.ssr.upm.es (F.Á.G.)

⁵ Campus Bruges, VIVES University of Applied Sciences, Xaverianenstraat 10, 8200 Bruges, Belgium; aline.ollevier@vives.be

⁶ BYTE COMPUTER S.A., 98 Kallirrois & Trivoli Str., GR 117 41 Athens, Greece; cvassiliou@byte.gr

⁷ AFEdemy, Academy on Age-Friendly Environments in Europe BV, Buurtje 2, 2802 BE Gouda, The Netherlands

* Correspondence: willeke@afedemy.eu; Tel.: +33-6-81-47-55-40

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Abstract: Despite its proven potential for systemic change, large-scale investment (both public and private) in sustainable homes still faces barriers, often caused by insecurity about personal, societal and financial returns on investment and a lack of clarity about concrete elements of sustainable age-friendly living environments and the choice of building, retrofitting and adaptation measures to be implemented. The projects that contributed to this workshop are developing solutions to tackle these barriers and propose a holistic and integrated approach to progress on implementation.

Keywords: housing; ageing; health; well-being; smart building; certification

1. Introduction

The building stock in Europe today is still not fit to support a shift from institutional care to the home-based independent living model for the ageing population. There is a recognised need to facilitate the development of community-based services and to stimulate the emergence of age-friendly home conversions. These homes should enable independent living and remote health monitoring to the growing ageing population. In addition to physical/spatial alterations, making homes age-friendly should include upgrading existing ICT infrastructure to support digital services for independent living and connected and integrated care including telehealth and telecare, as well as solutions supporting health status and healthy lifestyle, while enhancing energy efficiency and eco-sustainability.

This workshop (recording available—see Video S1) brought together a selection of EU-supported initiatives that are developing innovative solutions for supporting the development of investment in sustainable housing and environments that support the health and well-being of its

occupants. Projects presented their research and discussed and benchmarked potential challenges that they face together.

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2. Homes4Life

Our homes should be places that support our independence and autonomy, allow us to remain active and healthy and promote our social inclusion and engagement within our communities whilst respecting our lifestyle choices and evolving needs as the years go by. Age-friendly housing is therefore relevant for all citizens and has a tremendous potential to impact on our health and wellbeing, our social interactions and our capacity to participate in community life [1].

The Homes4Life [2] project aims to provide European citizens with better choices for independent living at home and in the community, supported by the full range of digital opportunities, and leverage investments to update Europe's built environment so that it is ready to meet the challenges of home-based independent living models.

Homes4Life addresses the existing barriers to boost investments in a smarter age-friendly building stock by developing and implementing a certification scheme in close collaboration with end-users and relevant European R&I initiatives. This scheme is ready for wide-spread adoption by a dedicated community of lead users and will provide guidance for public and private investors. One of its goals is to clarify what the dimensions of smarter age-friendly environments are, not just those related to the physical domains, like accessibility or outdoor access, but also the ones that have to do with the personal, social and economic domains of our homes. The Homes4Life consortium adopts a common vision that does not stigmatise older age when it is discussed how housing should look like in the future.

3. TeNDER

Affective based integrated care for better Quality of Life (TeNDER [3]) is a European research project developing an integrated care model to improve the quality of life of persons suffering from Parkinson's disease, Alzheimer's disease and other forms of dementia, and cardiovascular diseases. The focus is here not only on the patients but also on those who surround them.

TeNDER will conduct five large-scale pilots in different real-life scenarios (such as hospital, home, day-care and rehabilitation centres). The used tools allow among other things, capturing movement, innovative affective recognition, and the record of basic vitals. TeNDER combines technologies that are easy to use and well-known to the citizens, such as smartphones, health bands, motion sensors, cameras, microphones and other similar devices.

This project's approach to integrated care seeks to: (1) help extend patients' independence safely and ease the burden of care and (2) facilitate communication across patients' care provision systems. The project complies with rigorous ethical guidelines to ensure complete data protection and safety.

TeNDER aims to include all participants (patients, families, caregivers and professionals) in all stages of development of this new ICT-supported integrated care solution and therefore to maximize the potential of digital devices. To involve participants from all levels of care builds trust among them and empowers the users. TeNDER's vision is, after all and above all, person-centred.

4. SHAFE

A new concept was created in 2017 based on the desire to implement Smart Healthy Age-Friendly Environments (SHAFE) across Europe, fostering happier and healthier people in all communities. This idea took shape and became a solid movement. This is how SHAFE was born and further launched in 2018, as a Thematic Network, approved by the European Commission, with the

ambition to draw policymakers', organisations' and citizens' attention to the need for better alignment between health, social care, built environments and ICT, both in policy and funding. The conclusions of this extensive work, gathering over 160 organisations as partners, was delivered to the European Commission and Member States in a Joint Statement and a Framing Paper in December 2018.

After this, SHAFE evolved a European Stakeholders Network, which is currently working to achieve better 'Cooperation' and 'Implementation', as the major challenges for the next period. This is the main aim of the Position Paper [4] released in October 2020, presenting recommendations that aim to promote healthier environments for all citizens and to make environments accessible, sustainable and reachable for all, with the support of ICT.

The pandemic has uncovered the major opportunities and benefits of turning digital. However, single digital solutions are not the panacea to all the societal challenges.

Citizens across different age groups also need personal human contact: they need to meet, to talk to each other, to hug and to love. Digitalization cannot replace this human need but can be a powerful vehicle to support people. The scenario during 2020 is an opportunity for the digital revolution to be well-thought-out and implemented if all the adequate challenges are considered and tackled well.

The Smart Healthy Age-Friendly Environments Network will thus focus on the narrative, debate, disclosure and knowledge translation of smart digital solutions and of solutions to optimize the physical and social environments of individuals in a concerted manner, bringing together also the domains of health and social care. The position paper will also provide indicators to measure progress and success on the realization of SHAFE.

5. Hands-on-SHAFE

The Erasmus+ Hands-on SHAFE [5] project (2019-2022) aims to deliver training packages for informal learning experiences and hands-on tools to improve the skills of people of all ages and especially seeks to enable people with lower skills or qualifications to choose and implement smart, healthy, age-friendly environments in their own homes or neighbourhoods. In this way, the project fosters and promotes social inclusion for people of all ages and genders, including people with cognitive or physical impairments or disabilities. It also aims to enable people to become innovators and trailblazers in their own neighbourhoods or to become entrepreneurs in the field of smart, healthy, age-friendly environments services and products. The (online) training packages will focus on SMART solutions at home or on the way, HEALTHY living, lifestyle, therapies and dealing with diseases or impairments and BUILT indoor and outdoor new and existing environments. For people who want to start their own business in the field of SHAFE a BUSINESS module will become available.

6. NET4AGE-FRIENDLY

The main aim of NET4AGE-FRIENDLY (International Interdisciplinary Network on Health and Wellbeing in an Age-friendly Digital World) is to develop an international ecosystem based in an interdisciplinary network of researchers and stakeholders from all sectors that enables the practice and deployment of Smart Healthy Age-Friendly Environments (SHAFE). This COST Action is formed by different members of working groups in age-friendly environments to foster awareness and to support the creation and implementation of smart, healthy indoor and outdoor environments for present and future generations.

The NET4AGE-FRIENDLY themes will be focusing on:

- User-centred and inclusive design in age-friendly environments and communities (WG1)
- Integrated health and wellbeing pathways (WG2)
- Digital solutions and large-scale sustainable implementation (WG3)
- SHAFE impact and sustainability (WG4)
- Reference framework (WG5).

The main approach of NET4AGE-FRIENDLY is the establishment of new local or regional ecosystems or the expansion of existing ones in each involved European country to work on health

and wellbeing in an age-friendly digital world through the exchange of practices, networking and the creation of open access inclusive and innovative contents and dissemination activities.

7. AGE'IN

The AGE'IN [6] project aims to keep the ageing population independent in their own homes for longer by combining home adaptation and local ecosystem for ageing, improving their quality of life, the quality of their environment (services, public space, etc.) and promoting actions to develop social bonding. The focus is on technological tools, with their accessible possibilities to integrate at home, the non-stigmatizing use of this technology and awareness in this target group.

To achieve this, we got an insight into how age-friendly today's houses are. We screened 110 houses in West Flanders, Belgium, and are still screening them in the Netherlands with the Housing Enabler assessment. In order to gain full insight into the barriers and opportunities that the residents of these houses identify for ageing, we organized focus groups where remarkable aspects came to light.

In addition, we conducted a systematic review to identify which technology was proven to be effective in promoting independent living at home with conclusive evidence. Together with the results of our systematic review, we explored the market and identified an impressive list of easily accessible technologies to support the ageing population. These technologies are currently being tested within our team of professionals, students and soon the ageing population itself. A set of videos of technologies supporting ageing in place will help us to inform, motivate and support the ageing population.

Meanwhile, we are developing a highly innovative cooking platform to increase the ability to prepare a meal of one's choice at home for as long as possible. Light guide and audio instructions will assist in preparing a healthy meal.

8. PHArA-ON

In Europe's rapidly ageing society, there is a growing need for tools that will improve the quality of life, independence and overall health of older adults. Advanced ICT solutions that combine technologies from multiple disciplines can address this problem, but the market is fragmented and many solutions have limited scope.

The overall objective of the Pharaon [7] project—Pilots for Active and Healthy Ageing—is to provide support for Europe's ageing population by integrating digital services, devices and tools into open platforms that can be readily deployed while maintaining the dignity of older adults and enhancing their independence, safety, and capabilities. The project will utilise a range of digital tools, including connected (IoT) devices, artificial intelligence, robotics, cloud and edge computing, smart wearables, big data and intelligent analytics that will be integrated to provide personalised and optimised health care delivery.

Pharaon's integrated platforms will be validated in two stages: pre-validation and large-scale pilots (LSPs), in six different pilot sites: Murcia and Andalusia (Spain), Portugal, The Netherlands, Slovenia and Italy. A set of development tools will be created and made publicly available to simplify the customisation and integration. Pharaon will ensure user-friendly human-computer interaction, addressing various capacity limitations and providing rapid access to useable information through a user-centric approach.

9. SmartWork

The design and realization of age-friendly living and working environments is a huge challenge that we have just only started to address as the number of older citizens who are and want to continue being active members of society and live independently is constantly increasing.

The SmartWork [8] project builds a Worker-Centric AI System for work ability sustainability, which integrates unobtrusive sensing and modelling of the worker state with a suite of novel services for context- and worker-aware adaptive work support. The unobtrusive and pervasive monitoring of health, behaviour, cognitive and emotional status of the worker enables the functional and

cognitive decline risk assessment. The holistic approach for work ability modelling captures the attitudes and abilities of the ageing worker and enables decision support for personalized interventions for maintenance/improvement of the work ability. The adaptive work environment supports the older worker with optimized services for on-the-fly work flexibility coordination, seamless transfer of the work environment between different devices and different environments, and on-demand personalized training. The SmartWork services and modules for on-the-fly work flexibility also empower the employer with AI decision-support tools for efficient task completion and work team optimization through flexible work practices. Optimization of team formation, driven by the semantic modelling of the work tasks, along with training needs prioritization at team level to identify unmet needs, allows employers to optimize tasks, shifting focus to increased job satisfaction for increased productivity. Formal/informal carers are enabled to continuously monitor the overall health status, behavioural attitudes and risks for the people they care for and adapt interventions to the evolving workers status, thus providing full support to the older office workers for sustainable, active and healthy ageing.

10. Key Findings and Conclusions

The projects that contributed to this workshop cover all the dimensions to be taken into consideration when talking about sustainable living environments. They address the challenge from different perspectives, focusing on the health perspective in TENDER, homes for all life course in Homes4Life, digitalisation for independent living in Pharaon and working environments as we grow older in SmartWork, and provide guidelines for the development of friendly environments and identifying business models in Hands-on-SHAPE and policy development in AGE'IN, NET4AGE and SHAPE.

All projects bring a holistic perspective to the issue, even if they focus on one of the dimensions, as it is a cross-cutting issue that requires the involvement of all actors and all perspectives. Although this holistic vision is necessary when addressing the issue of age-friendly living environments, there is still a fragmented approach from public policies and research-support programmes.

The situation that we are currently experiencing with the COVID pandemic has made it even more evident that the environments in which we live have a tremendous impact on our health and well-being and that beyond being places where we sleep, work or walk, they are also places where we develop our life projects in all their domains. These are difficult times, but they also present an opportunity to rethink the approach taken by policies and by extension to all other areas.

Our aim is to be a sustainable society, and social sustainability occurs when the formal and informal processes, systems, structures and relationships actively support the capacity of current and future generations to create healthy and livable communities [9].

Supplementary Materials: The recording of the workshop is available online at <https://www.sustainableplaces.eu/home/sp20-workshops-events/sustainable-housing-supporting-health-and-well-being-2-2/>; Video S1: Sustainable Housing Supporting Health and Well-Being workshop at SP20 recording.

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