

D6 Final report on user-centred design of Age-Friendly Environments



International Interdisciplinary Network on
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EXECUTIVE SUMMARY

The main goal objective of this document is to present a summary of the existing knowledge and a critical assessment of practices in inclusive design of innovative solutions for the implementation of Smart Healthy Age-Friendly Environments (SHAFE), as well as recommendations for the future, in line with the objectives defined for the Working Group 3 of NET4Age-Friendly:

- Synthesise and improve the state of the art of existing knowledge and practices regarding inclusive design of innovative solutions of Smart Healthy Age-Friendly Environments
- Report, discuss solutions and deliver the knowledge module *user-centred inclusive design* for the Reference Framework.

In this document, the process of creation, development and mapping of the *Matrix to synthesize existing knowledge and critically assess practices of inclusive design of innovative solutions for SHAFE* is detailed. This online document was designed to collect and critically assess existing knowledge and practices of inclusive design across various domains, such as architecture, urban planning, interior design, healthcare, and social care. The Matrix was open to all WG1 members and gathered information on methods, definitions, examples of use, and initiatives that align with user-centered design principles of inclusion, accessibility, usability, and engagement.

1. INTRODUCTION

1.1 Background

The main aim and objective of the COST Action NET4Age-Friendly is to develop an international ecosystem based on a network of researchers and stakeholders that enables the practice and deployment of Smart Healthy Age-Friendly Environments (SHAFE). The primary purpose is to reach a wide range of countries to spread awareness of and develop the SHAFE concept both in rural and urban areas.

Working Group 1 (WG1) of the Action, *User-centred inclusive design of age-friendly environments and communities*, has the objective of synthesizing existing knowledge and critically assessing the inclusive design practices of innovative solutions of SHAFE. Through international cooperation and multidisciplinary collaboration, NET4Age-Friendly is cementing the international participation in the field of age-friendly design, contributing thus towards more capacity building and multidisciplinary work in the fields of climate-neutral built and social environment, healthcare and wellbeing, and ICT.

1.2 Objective

The purpose of this report is to establish a benchmark for existing Age-Friendly Environments and Technologies, providing an overview of the State-of-The-Art (SoTA). This document stems from the evaluation of a document titled *Matrix to synthesize existing knowledge and critically assess practices of inclusive design of innovative solutions for SHAFE*, conducted by the Working Group 1 members during the last three years.

The matrix includes 112 innovative solutions promoting inclusive design in various domains of Smart Healthy Age-Friendly Environments (SHAFE), such as, architecture, urban planning, interior design, healthcare, and social care. All proposed initiatives must align with the key principles of user-centered design, namely, usability, engagement, inclusion, and accessibility. Consequently, each solution was evaluated based on specific criteria derived from these principles.

The evaluation criteria included UCD principles: inclusion, accessibility, usability, engagement, and new ones that are used on SHAFE Framework: impact, scale, sustainability, and affordability. Each criterion received a score on a Likert scale ranging from 1 to 5, where 1 signifies 'not inclusive/usable/engaging/accessible at all,' and 5 indicates 'completely inclusive/usable/engaging/accessible.' This approach facilitates the identification of strengths and weaknesses for each solution, offering an overview of the current landscape, successful implementations, and areas for improvement. We decided to include in the final analysis only the ones that score more than 25 points.

A part of the WG1 members actively participated in the evaluation process, which was carried out by completing data on Excel sheets. These sheets not only contain scores for each criterion but also personal comments on the proposed solutions. These comments aim to provide a comprehensive explanation of key points and a general evaluation, contributing to a thorough quality analysis.

2. User-centered design in Age-Friendly Environments

User-centered design represents a process in which the potential users are involved in the design of a product, tool, software, etc. from the beginning through to the final result (IxDF, 2016). The involvement can have various formats; however, the basic steps and requirements are the same. Four areas / properties are closely related to these processes, namely inclusion, accessibility, usability and engagement. There are various definitions and descriptions for these processes, however, in the next subsections we focus on those related to the topic of age-friendly environments.

2.1 Inclusion – definition and significance: ensuring inclusion for all ages

Inclusion is a universal human right which is based on the idea that every individual has the right to be fully incorporated into society (European Commission, 2021). It formulates the right of equal access and opportunities and the removal of discrimination and intolerance (removal of barriers). The understanding of inclusion may also be connected to some type of disability, covering a broad spectrum from learning disabilities, motoric disabilities, cognitive impairments and age-conditioned disabilities.

Inclusion means to transform communities based on social justice principles in which all community members are presumed competent; are welcome as valued members of their community; are able to fully participate with their peers; and experience reciprocal social relationships (Gentilini, 2021).

There are different levels of participation. Two basic examples are physical access and programmatic access. Physical access is related to the physical environment that is accessible to all people, in other words no supports for participation are necessary. The simplest example is an entrance door to a building that was designed to be accessible to all people (i.e., it is wide enough, without steps or with a ramp for people who use mobility aids): there is no need for a special door for people with disabilities because the common door is accessible to anyone.

Programmatic access requires potential support realized by people (e.g. volunteers) and/or technology to ensure that individuals with disabilities can participate. Eliminating programmatic barriers, such as communication and sensory barriers, creates programmatic accessibility. For example, a communication barrier may be using technical jargon rather than plain language, or having a website that is inaccessible to screen reading software. Developing accessible spaces by using universal design principles usually should tackle these types of barriers and enable full participation. (United Way of South Central Michigan, 2022)

Inclusion is frequently grouped together with diversity and equity. They are interconnected and only their combination leads to true impact. Diversity (Global Diversity Practice, n.d) refers mostly to the representation of various groups in the community, workplace, sports teams, etc. Examples of diversity include gender, race,

ethnicity, physical ability, sexual orientation, neurodiversity, age. The list is not exhaustive. Depending on the context, the range of diversity can be wider.

Nobel Prize winner Richard Thaler (Javetski & Koller, 2018) explains his view on diversity in an interview with McKinsey on debiasing the corporation: “There’s lots of talk about diversity these days. We tend to think about that in terms of things like racial diversity and gender diversity and ethnic diversity. Those things are all important. But it’s also important to have diversity in how people think.”

Inclusive design reflects the properties of inclusion. Inclusive design aims at making places, products, tools, software, etc. in such a way that everyone can use them. The way environments and products are designed affect the ability to move, see, hear, understand and communicate effectively. It also aims at removing barriers that might lead to undue effort or separation.

Universal design (Centre for Excellence in Universal Design, n.d.) is a broader concept that can be characterized as the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.

Sidewalks with curb cuts and doors that automatically open when a person moves near them are examples of universally designed products. They benefit people with disabilities, parents with baby strollers, delivery workers, and others. Human characteristics considered in universal designs may include age, gender, stature, race/ethnicity, culture, native language and learning preference.

In the case of information technology, products that are universally designed are accessible to and usable by people with a wide variety of characteristics, including different types of disabilities. These products are often designed to eliminate or minimize the need for assistive technologies. At the same time, they are compatible with common assistive hardware and software devices.

Universal design has been in the focus of research for more than two decades, in particular, in the context of the concept of ageing successfully (Carr et al., 2013). The authors formulate the concept of ageing successfully in relation to design and propose basic principles of universal design, accompanied with examples of different product areas (buildings, furniture, software, etc.).

During this period, standards for construction (World Disability Union, n.d.), web pages and other areas were developed (or modified from previous norms that did not consider the requirement of inclusion). Additional sources are mentioned in the next subsections, in which the terms accessible design and usable design are explained.

2.2 Accessibility - definition and significance – ensuring accessibility for all ages

Accessibility is the design of products, devices, services, vehicles, or environments so as to be usable by people with disabilities (Wikipedia, 2016). The concept of accessible design and practice of accessible development ensures both "direct access" (i.e. unassisted) and "indirect access" meaning compatibility with a person's assistive technology.

Accessibility can be viewed as the "ability to access" and benefit from some system or entity. While the concept focuses on enabling access for people with disabilities, or enabling access through the use of assistive technology, research and development in accessibility brings benefits to everyone, irrespective of ability. Therefore, an accessible society should eliminate any digital divide or knowledge divide. In this context, accessibility also means the possibility to access various services that require the use of a necessary tool. For example, a web application is designed as accessible. However, the user needs a smart phone, laptop or a computer to be able to use the application. This is another facet of accessibility.

Accessibility is not to be confused with usability (Georgakas, 2023)., which is the extent to which a product (such as a device, service, or environment) can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.

Accessibility is strongly related to universal design (Wikipedia, 2021), the process of creating products that are usable by the widest possible range of people, operating within the widest possible range of situations. Universal design typically provides a single general solution that can accommodate people with disabilities as well as the rest of the population. By contrast, accessible design is focused on ensuring that there are no barriers to accessibility for all people, including those with disabilities.

Accessibility for older people

Accessibility is an important issue for older people, especially those with physical or cognitive limitations. The lack of accessibility can be a barrier to healthy and active aging, as well as to participation in society and the economy.

There are still many barriers to be overcome to ensure that older people can enjoy a full and autonomous life. Urban infrastructures that do not consider the mobility needs of older people, such as, inadequate public transportation, inaccessible health services, and a lack of adapted technologies are just a few examples of obstacles that need to be overcome. These problems are very well described in an article by I.K.Zola (2005). Although it was published almost 20 years ago, many of the described problems still persist today.

Furthermore, accessibility is also important when it comes to social inclusion and participation in the economy. Older people can have a lot to contribute to society, whether through work, volunteering, or

participation in cultural and sports activities. However, for this to happen, there must be opportunities and means for them to engage actively.

Some initiatives and projects are already being undertaken worldwide to promote accessibility for older people, such as adapted transport programs, the construction of accessible urban infrastructure, and the creation of technologies that meet the needs of older people. The use of technologies by older people is still less than that of other ages. For example, without proper access to devices such as smart phones and internet connection they are losing the ability to stay connected with family and friends. Another issue for older people is loss of the ability to drive. Ride-share services or autonomous vehicles could offer a solution, but the financial aspect must be considered.

However, there is still much work to be done to ensure that all older people can enjoy a full and autonomous life.

Accessible Design

Accessible design is a design process in which the needs of people with disabilities are specifically considered. *Accessibility* sometimes refers to the characteristic that products, services, and facilities can be independently used by people with a range of disabilities.

Several countries have already adopted legislation that specifies requirements and standards for construction of public facilities and services and develops accessibility standards for software, hardware, websites, videos, and other information technology. The European Union adopted the European Accessibility Act (EAA) in 2019 (Official Journal of the European Union, 2019). The Directive (EU) 2019/882 aims to improve the accessibility of a wide range of digital products and services to foster the participation and inclusion of individuals with disabilities in society. By establishing accessibility requirements and standards for products and services that are most relevant to people with disabilities, the EEA intends to reduce barriers created by divergent rules in Member States.

Legislation on accessibility has also been adopted outside the EU. Examples include the Americans with Disabilities Act (ADA), which mandated that public facilities and services be fully accessible to people with disabilities; an amendment to Section 508 of the Rehabilitation Act of 1973 (General Services Administration). The amendment mandated that the Access Board (U.S. Access Board, n.d.) develop accessibility standards for software, hardware, websites, videos, and other information technology. Although these standards apply directly to the development, procurement, modification, and use of information technology of U.S. federal agencies, many states, educational institutions, and other entities have adopted them as one way to meet their ADA obligations.

There are also international initiatives and standardization organizations that develop standards and guidelines with the most important being ISO, IEC, IEEE and W3C.

ISO (International Organization for Standardization) is an independent, non-governmental international organization. Its members are 165 national standards bodies. The standardization work is performed in more than 250 technical committees in which experts delegated by the national standards bodies develop consensus-based and market relevant International Standards. These standards are aimed at supporting innovation and providing solutions to global challenges.

IEC (The International Electrotechnical Commission) is an international standards organization that is constituted by national electrotechnical committees. Its activities build on international cooperation in the area of standardization in electrical and electronic technologies. Based on that, IEC publishes various documentation, prepared by IEC technical committees, such as, International Standards, Technical Specifications, Technical Reports and Publicly Available Specifications and Guides.

IEEE (The Institute of Electrical and Electronic Engineers) is a professional association for electronic engineering and electrical engineering (and associated disciplines). IEEE has many societies, committees and working groups. They are also active in developing standards, in particular, industry standards in a broad range of technologies. Currently [January 2024], there are nearly 1,300 standards and projects under development.

The World Wide Web Consortium (W3C) is the main international standards organization for the Internet. The Web Content Accessibility Guidelines (WCAG) is the best guidance for making technology useful to all users, including people with disabilities and the aging demographic. The WCAG guidelines were published in December 2008 by the Web Accessibility Initiative (WAI) of W3C. WCAG 2.0 is an internationally recognized and adopted standard and is approved as an ISO standard.

By designing WCAG 2.0 around principles, rather than technology, designers and developers are asked to meet all four of the following principles for users with disabilities:

- **Perceivable:** Information and user interface components must be presentable to users in ways they can perceive. This means that information should not be invisible to users' senses, as users must be able to perceive all relevant information in your content.
- **Operable:** User interface components and navigation must be operable. This means that users must be able to operate the interface successfully.
- **Understandable:** Information and the operation of the user interface must be understandable. This means that users must be able to understand the information as well as the operation of the user interface.

- Robust: Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies. Content must be accessible to all users, keeping up with advances in technology, such as mobile technology.

The W3C WAI offers an extensive literature review on how WCAG 2.0 addresses the accessibility needs of older web users in: *Developing Websites for Older People: How Web Content Accessibility Guidelines (WCAG) 2.0 Applies* (W. W. A. Initiative, 2024).

WCAG 2.1 guidelines are currently under development. There are three task force proposals under review to strengthen its coverage. All three proposals contain recommendations that will directly benefit the needs of the aging demographic: users with cognitive or learning disabilities; users with low vision; small- and touch-screen mobile devices.

Design of new technologies and software has demonstrated that it is nearly impossible to group and generalize older people for design as it is done with children and adults. For each individual, ageing is unique, gradual and personal. Everyone has their own level of ability as they age, and the techniques they use to adapt to ageing are as unique as the creases in their palms. Design heuristics and accessibility guidelines may not cover older people so simply. Several aspects must be considered: design must be approached from multiple perspectives; many older people are less comfortable with technology, and some are risk averse; many older people are uncomfortable trying new things or hesitant to explore.

Ultimately, each generation is at risk of facing similar barriers until technology can truly be personalized. We must move past the mass produced, one-size-fits-all user experiences. Personalization will enable designers to tailor the user experiences to accommodate specific individuals and align with their needs.

2.3 Usability - definition and significance: ensuring usability for all ages

Similar to the preceding terms, usability has several definitions depending on the type of product. ISO defines usability as "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use." (International Organization for Standardization, 2018) Usability can be described as the capacity of a system to provide a condition for its users to perform the tasks safely, effectively, and efficiently. Usability can also include the concept of prototypicality, which is how much a particular thing conforms to the expected shared norm, for instance, in website design, users prefer sites that conform to recognized design norms. Usability is often associated with the functionalities of the product.

Usability can be tested on a wide spectrum of products, from software applications, websites, tools, machines, vehicles to processes; simply anything a human interacts with. Usability study can be performed

by different professions, such as usability analyst, designer, engineer, marketing personnel, and/or potential users.

Usability includes methods of measuring usability that is part of the whole process of design, development and evaluation of the future product.

Any system or device designed for use by people should be easy to use, easy to learn, easy to remember (the instructions), easy to control, and helpful to users. These requirements are not new as John Gould and Clayton Lewis formulated the following three design principles in 1985:

- Early focus on end users and the tasks they need the system/device to do;
- Empirical measurement using quantitative or qualitative measures;
- Iterative design, in which the designers work in a series of stages, improving the design each time.

Each principle can be realized in several ways depending on the product, its functionalities and complexity, and potential users. An inevitable part of the process is evaluation, for which various methods are available.

Early focus on users and tasks

The design team should be user-driven and should be in direct contact with potential users. Several evaluation methods, including personas, cognitive modelling, inspection, inquiry, prototyping, and testing methods may contribute to understanding potential users and their perceptions of how well the product or process works. The designers must know who the users will be, whether they have experience with similar systems, or whether the developed system is completely novel. Analyses must be carried out regarding what tasks the users will perform, which are most important, and what decisions the users will make while using the system. Designers must understand how the cognitive and emotional characteristics of their users will engage with a proposed system.

Empirical measurement

The developed system must be tested throughout the whole design and development process. It should include tests with real users using behavioural measurements. This includes testing the system for both learnability and usability. It is important at this stage to use quantitative usability specifications, such as time and errors to complete tasks and number of users to test, as well as examine performance and attitudes of the users testing the system. There are many evaluation methods available.

Iterative design is a design methodology based on a cyclical process of prototyping, testing, analysing, and refining a product or process. Based on the results of testing the most recent iteration of a design, changes and refinements are made. This process is intended to ultimately improve the quality and functionality of a design. In iterative design, interaction with the designed system is used as a form of research for informing

and evolving a project, as successive versions, or iterations of a design are implemented. The key requirements for iterative design are, the identification of required changes, an ability to make changes, and a willingness to make changes. When a problem is encountered, there is no set method to determine the correct solution. Rather, there are empirical methods that can be used during system development or after the system is delivered, usually at a more opportune time. Ultimately, iterative design works towards meeting goals such as making the system user friendly, easy to use, easy to operate, simple, etc.

The importance of usability methods is also confirmed by the existence of standards. Here we present the most significant ones:

ISO/TR 16982:2002 ("Ergonomics of human-system interaction—Usability methods supporting human-centered design") is an International Standards Organization (ISO) standard that provides information on human-centered usability methods that can be used for design and evaluation. It details the advantages, disadvantages, and other factors relevant to using each usability method. It explains the implications of the stage of the life cycle and the individual project characteristics for the selection of usability methods and provides examples of usability methods in context.

ISO 9241 is a multi-part standard that covers a number of aspects of people working with computers. Although originally titled *Ergonomic requirements for office work with visual display terminals (VDTs)*, it has been retitled to the more generic *Ergonomics of Human System Interaction*. As part of this change, ISO is renumbering some parts of the standard so that it can cover more topics, e.g. tactile and haptic interaction. The first part to be renumbered was part 10 in 2006, now part 110.

IEC 62366-1:2015 + COR1:2016 & IEC/TR 62366-2 provide guidance on usability engineering specific to a medical device.

2.4 Engagement - definition and significance: ensuring engagement for all ages

For our context the closest dictionary definition of engagement is 'being involved with or taking an interest in something'. However, this does not fully capture and reflect what engagement really means to us. One of the interesting things about engagement is that we tend to feel or know when it is happening, even if we cannot exactly define it. Whether we are in an exhibition, a lecture hall, or any other space, we instinctively know that something positive is happening when people are alert, excited, talking about their experience and wanting to do or find out more.

de Vreede, et al., offers a comprehensive definition of engagement and a measurement scale that can be used across domains and contexts. This was derived by iteratively refining the items in this scale through a

series of five data samples to arrive at the final scale. The authors propose that engagement is a three-part phenomenon, which manifests in one or more of the following three forms:

1. Affective/Emotional engagement: the extent to which individuals experience a positive psychological reaction or attachment towards a specific activity or situation.
2. Behavioural engagement: the extent to which individuals can be observed to exert effort and show persistence to remain involved in an activity or situation.
3. Cognitive engagement: the extent to which individuals are cognitively absorbed in a task or activity resulting in a reduced awareness of their surroundings.

There is a specific understanding of engagement in the area of information technologies, where the term “engagement” refers to user interactions over an interface. It is commonly applied to social media, but engagement can be measured on any platform or website. Typical indicators of engagement include number of page views, bounce times, time spent on a site, user tracking and other metrics.

It is possible to specifically distinguish user/customer engagement and employee engagement.

User or customer engagement is basically assessing an individual’s response to a digital offering: a service, a product or a website. It is important because highly engaged users are the people who are likely to try, buy, or share feedback about a product or service. It is measured by tracking the users’ activities such as downloads, clicks, shares, and more.

Employee engagement is a human resources (HR) concept that describes the level of enthusiasm and dedication a worker feels toward their job. Engaged employees care about their work and about the performance of the company and feel that their efforts make a difference.

3. Benchmark of existing environments and technologies

3.1 Review of Age-Friendly Environments and best practices

The evaluation of the document titled *Matrix to Synthesize Existing Knowledge and Critically Assess Practices of Inclusive Design of Innovative Solutions for SHAFE*, conducted by Working Group 1 members, allowed to establish a benchmark, including best practices and innovative solutions promoting inclusive design in various domains of Smart Healthy Age-Friendly Environments.

Eight criteria related to UCD principles (i.e., inclusion, accessibility, usability, engagement) and SHAFE Framework (i.e., impact, scale, sustainability, affordability) were used.

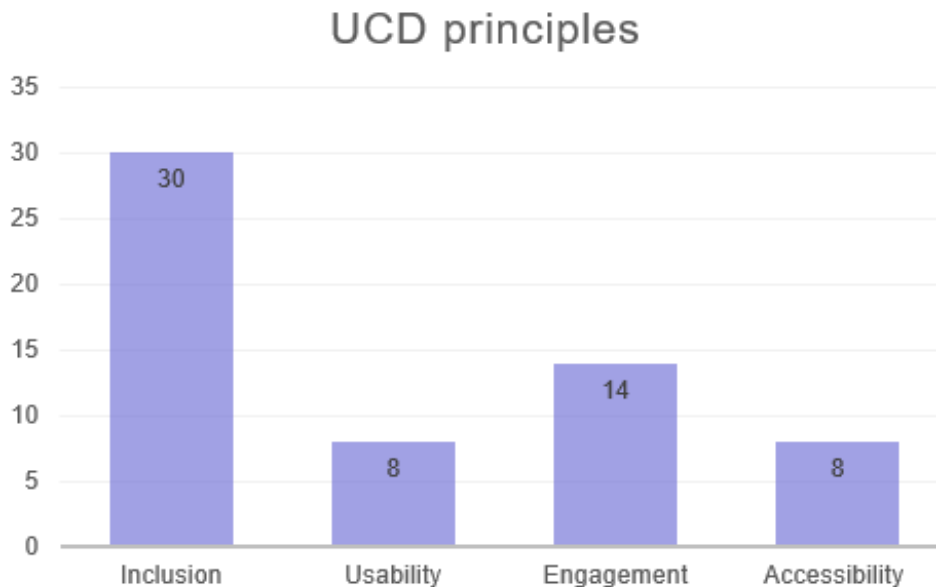


Figure 1 – Evaluation of the practices according to UCD principles

Each criterion received a score on a Likert scale ranging from 1 ('not fulfilled') to 5 ('completely fulfilled'). Only practices and solutions that score more than 25 points were included in the final analysis. Out of the 112 solutions, 60 were selected (figure 1). Solutions were excluded when they didn't satisfy requirements in terms of evaluation criteria, and in several cases because they were theoretical articles, which did not allow to assess a concrete implementation of solutions in the real world.

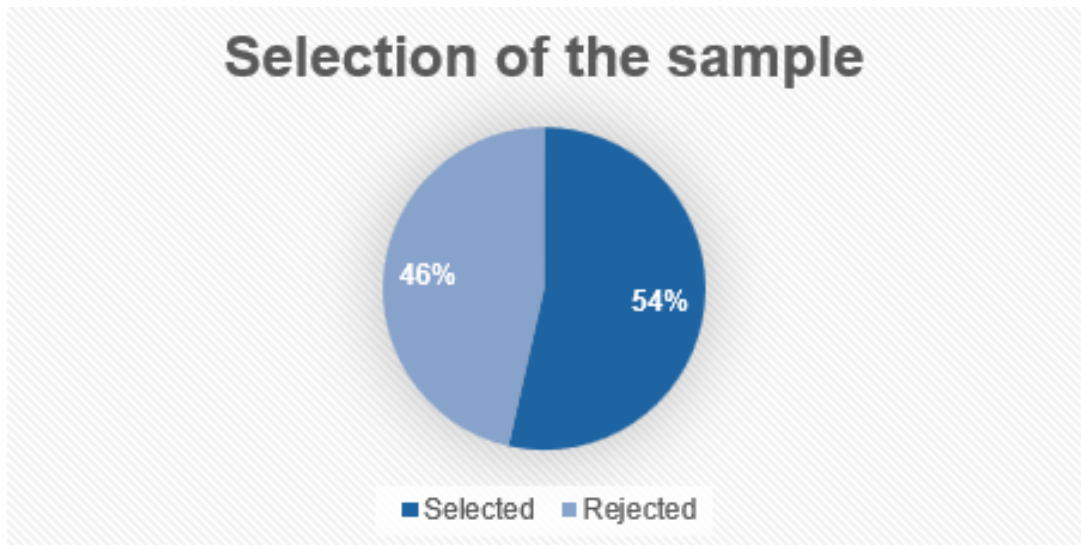


Figure 2 - Selection of the Sample

In figure 2, the scores on the scales are shown for the 60 solutions selected.

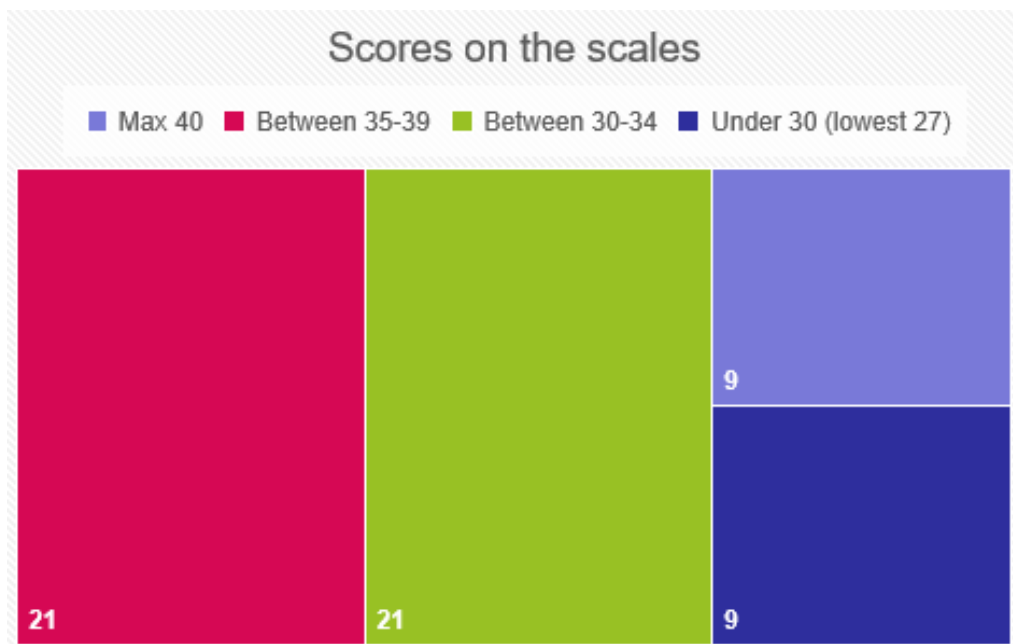


Figure 3 – Scores on the scales

The 60 selected practices concern mainly physical and digital age-friendly environments (figure 3). In this document, we refer to 'environments' for physical environments and 'digital solutions' (such as serious games, online courses, various platforms, virtual reality implementation, and wearable devices - Chapter 3.2) for the digital environments.

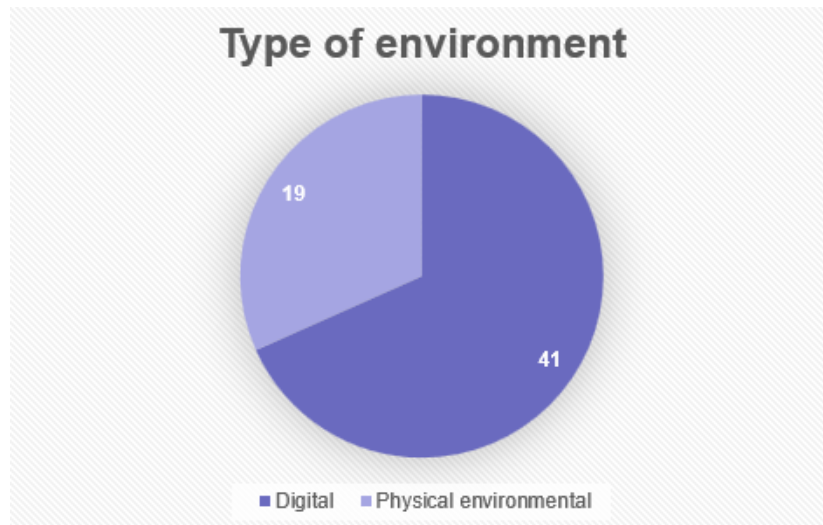


Figure 4 - Type of environment

Environments include the organizations that promote social activities, dissemination projects for users, training on methods of improving the design of environments, and co-design methods.

Organisations

Some organizations like Covilhã Senior Academy, Age Friendly Ireland, and Dreamlike Neighbourhood satisfied different user needs. In particular, Covilhã Senior Academy is a non-profit organization in Covilhã, Portugal, that organizes a lot of activities with older people, giving them the opportunity to constantly learn something new, including language classes, physical activities, and social activities. This solution reflects an excellent example of inclusion, engagement, and accessibility, making older people more active, happier, and consequently healthier. Dreamlike Neighbourhood is another example of an inclusive and engaged organization that addresses the social needs of older adults by fostering supportive neighbourhood groups. Dreamlike Neighbourhood organizes groups of neighbours in which they meet each other and stay active, discussing and playing games in an Age-Friendly Environment. Finally, the Age Friendly Ireland Programme is an integral component of a global initiative inspired by the World Health Organization (WHO). This initiative acknowledges and addresses the challenges and opportunities posed by Ireland's aging population. It empowers local authorities to spearhead a shift in perspectives on aging and to rethink how services are both planned and delivered. Age Friendly Ireland has a website full of resources aimed not only at users but also at those who design environments and those who take care of older people, informing them about what matters most to them and the environment in which they live. The Age Friendly Ireland Programme creates a lot of projects in terms of age-friendly, and this is the reason why it is considered one of the best practices. The pros of these kinds of solutions concern especially the impact on people's social life, allowing them to reduce loneliness and, consequently, giving them a better quality of life.

Dissemination projects for users

Some initiatives, like Heryasta and Akdeniz University, focus their attention on users and their knowledge. Specifically, Heryasta exploits its platforms to disseminate knowledge about mental health, physical health, active ageing, and suggestions to improve their quality of life. Whereas Akdeniz University in the city of Antalya has inaugurated an education program called Renewal University, targeting people over the age of 60. The program, which offers courses in sociology, psychology, biology, technology, chemistry, agriculture, pharmacology, medicine, history, philosophy, maintenance, and cooking, targets the cognitive renewal of these students. The possibility to develop new knowledge allows people to not only to stay mentally active and meet other people but also to improve their quality of life.

Training methods and tools for improving the design of SHAFE environments

Different initiatives include training about techniques and methods that directly improve the age-friendly level of an environment or incorporate an age-friendly approach at the start of the design process. Some of these projects include Age-friendly Environments Activists, Making Healthy Places projects, Age-Friendly Built Environment Assessment Project. Also, a number of scientific papers that discuss these projects are included. On one side, Age-Friendly Environments Activists is a project designed to support and train older adults who want to promote and foster age-friendly environments in their cities and communities and to influence municipal agencies in their decision-making.

Making Healthy Places project looks at such convergences and divergences within a particularly instrumental environment, the barriers and opportunities that appear to built environment practitioners when making healthy places. This research is based on Australia in New South Wales and has a sample of approximately 350 responses; a final sample of 221 was used in the analysis. The aim was to find a path on how to go about creating places that help deliver positive health and wellbeing outcomes for all. There is a longstanding recognition that strategic policy and health promotions fall short in the implementation of healthy placemaking. As such, there is an ongoing question about how to bridge the gap between the rhetoric of current healthy planning principles and the reality of what is being delivered and managed by practitioners on the ground. The survey and method applied could be replicated to other regions and help build the strategies for future developments. This project is considered to be one of the best practices for the positive impact it could have on Design implementation.

Also, the Age-Friendly Built Environment Assessment Project involved a demographic and population-based spatial analysis providing a snapshot of aging in the Peel Region; the development of an Age-friendly Built Environment Audit Tool, tailored to the context of Peel Region; a current-state assessment of eight sample neighborhoods with regards to age-friendly built environments; consultation with older people, caregivers,

younger adults, and organizations serving older people; and recommendations to address gaps and opportunities discovered through neighborhood audits. It is an example of preparedness for the future and assessment of the needs for the benefit of other regions. The methods used should be considered to scale up in other regions and continents. These projects have a key role to play in the analysis and enhancing of age-friendly environments, and such advancements would be challenging without this specific process. Embracing user-centered approach implies involving users in the process, exactly as co-design does.

3.2 Current technologies - assessing accessibility and usability

Within the area of digital environments, 25 practices were selected, several with scores between 35 and 40, which means that they were considered as very relevant by the evaluator.

This was the case of The Ageing in Place Challenge program, a funding initiative that aims to improve the quality of life of older adults and their personal caregivers through innovation for safe and healthy aging, supporting a sustainable model for long-term care, by shifting focus toward preventive home and community based care. The program engages older adults and caregivers as experts to evaluate the applications, thus ensuring that their perspectives influence the research pillars and collaborative projects.

One other relevant example is mobilisIG, which project aims to address significant challenges related to the social participation of people with disabilities, involving multidisciplinary expertise. By mapping accessibility information and ensuring real-time dissemination to mobile devices, the project holds promise in enhancing the mobility and social engagement of people with physical disabilities. The project's potential impact on improving social participation and the quality of life for those with disabilities is significant, offering a model that could be adapted in diverse geographical contexts.

Several of the other practices assessed very positively are in the area of training. This is the case of the MOOC on dementia care, which stands out for its inclusive approach, engaging multimedia content, and practical application through a serious game. It has the potential to make a significant impact on the daily practice of direct care workers. Moreover, the "Bridge the Gap!" project demonstrates a commendable initiative to bridge the digital gap and empower older citizens for active participation in age-friendly environments. The focus on training, accessibility, and engagement aligns with the objectives of creating a positive impact.

In a related area, Hands-on SHAFE aligns with the WHO concept of health and focuses on adaptation and self-management in the face of various challenges. It aims to enhance the quality of age-friendly physical environments, focusing on health, ICT, housing, public spaces, buildings, and mobility. It promotes social inclusion through training and practical tools, emphasizing universal design and the removal of physical barriers. The focus on creating safe, comfortable, and smart environments could positively impact health of,

potentially reducing social and healthcare costs. The AFECO project also presents a well-rounded initiative. Although still ongoing, it holds a strong potential for positive impact, particularly in engaging and empowering older individuals. In this same line, but more strongly based on gamification, the Big Game is a highly inclusive serious game, accommodating players with diverse needs. It is still maintained by the developers for further use, even after its conclusion.

3.3 Gaps and challenges: identifying areas for improvement

While the above-mentioned solutions have received favorable scores, there are notable areas that require improvement. A critical issue lies in the overall lack of integration of the user-centered approach principles, with exclusive focus on any single aspect. Additionally, the training on methods to improve environmental design lacks specific considerations for the characteristics of environments, such as comfort, indoor and outdoor safety, and the necessary health and climate-proof features for the well-being of occupants. These nuanced topics are crucial for evaluating the quality of the training.

To achieve a more inclusive design, accommodating the diverse needs of building occupants requires adopting a data-informed approach. This involves conducting interviews and surveys with users, analyzing the collected data, and implementing solutions based on identified gaps between suboptimal design and user needs, thereby enhancing usability. Interviews, surveys, or usability tests are indispensable for gaining valuable insights and refining the design and development of various environmental contexts.

The term "accessibility" emphasizes the importance of ensuring solutions are accessible to as many people as possible. Some solutions exhibit shortcomings in accessibility, particularly for individuals with disabilities, where software and platforms are not designed to cater to the needs of blind users or people with communication challenges. Additionally, in-person training may not always be accessible to individuals with physical disabilities lacking caregiver support. Furthermore, older individuals may not possess digital skills, necessitating assistance from caregivers to harness the benefits of digital solutions. Consequently, the ongoing challenge is to advocate for online and at-home training options for individuals who lack the independence to attend in-person sessions.

Regarding engagement, solutions that facilitate in-person interaction are preferred to foster general interaction and communication among individuals. It is also imperative to advocate for active involvement in the application of solutions, akin to the principles of co-design, which involves including individuals as active participants in the design process.

In summary, the current challenge involves fostering the integration of all principles within a user-centered design, ensuring its sustainability, scalability, and, most importantly, its profound impact on the lives and health of individuals across all age groups.

4. Evaluating Impact, Scale, and Affordability

4.1 Impact – Examining the Influence of Practices

The efficacy of practices is most pronounced when they adeptly address the unique needs of older adults, instigating positive outcomes that would be otherwise unattainable. The evaluation of impact necessitates a comprehensive consideration of the tangible and measurable benefits that these practices yield for the target demographic. These benefits encompass enhancements in both mental and physical well-being, elevated social connectivity, and an overall enhancement in the quality of life for older individuals. An in-depth analysis of the impact of each practice allows us to discern which initiatives prompt meaningful and enduring changes in the lives of the beneficiaries.

Furthermore, engaging people, namely older adults or those more vulnerable, in activities that involve them in social interactions, as well as physical and mental pursuits, can significantly contribute to the improvement of their health. While training programs aimed at disseminating age-friendly environment concepts are undoubtedly beneficial, their impact could be further optimized if the training is tailored for architects and other stakeholders involved in the creation of these environments. This targeted approach is crucial as architects and related professionals play a pivotal role in modifying and shaping the physical spaces that directly impact the well-being of individuals. Therefore, investing in training programs that cater specifically to these professionals can enhance the overall effectiveness and sustainability of age-friendly practices. This targeted training would be further enriched if it embraced the expertise of stakeholders in its development, for example, included the voice of older people, people with disabilities, children, pregnant women and many other people with specific needs. Also relevant is to include the inputs of health and social care professionals who provide support and care in their daily lives, such as Occupational Therapists (maximize independence), Speech and Language Therapists (communication accessibility), Psychologists (psychological well-being), and social workers, to name a few.

4.2 Scale and diversification - strategies for expanding applications

The pivotal nature of scaling and diversifying the applications of successful practices cannot be overstated when aiming for widespread impact. These strategic endeavors involve meticulous planning to identify avenues for replicating successful models in diverse regions and contexts. This process goes beyond mere replication; it necessitates adapting practices to suit the unique cultural, geographical, and demographic factors of each locale.

The pursuit of scaling and diversification also involves the cultivation of partnerships and collaborations with various stakeholders. This collaborative approach facilitates the seamless integration of successful practices into existing frameworks, ensuring their organic assimilation within diverse societal structures. By establishing robust partnerships, we create the basis for the exchange of knowledge and expertise, enriching the adaptability and applicability of successful practices.

Furthermore, the goal is to formulate a scalable and adaptable model that transcends geographical and cultural boundaries, enabling easy replication across disparate communities and environments. A nuanced consideration of different cultures becomes a key aspect in the planning process, ensuring that adaptations are culturally sensitive and resonate with the values of the communities involved.

The diversification of basic principles emerges as an essential aspect of this strategy. By embracing diversity in foundational principles, we enhance inclusivity, which, in turn, amplifies the potential impact of these practices. This deliberate focus on diversification not only accommodates unique regional requirements but also contributes to the overall scalability of successful practices, ensuring they resonate with a broader spectrum of communities. In essence, scaling and diversification serve as dynamic strategies that not only amplify the reach of successful practices but also enhance their relevance and effectiveness across varied landscapes.

4.3 Affordability - cost considerations for wider adoption

A preference naturally exists for solutions that are financially accessible to a broad spectrum of individuals. The assessment of affordability extends beyond the initial implementation cost, encompassing considerations of long-term financial sustainability. Practices demonstrating economic viability, coupled with the potential for widespread adoption, stand poised to generate substantial and enduring impacts on communities.

In examining the domain of affordability, it is important to explore various facets, including the funding mechanisms, grants, or collaborative initiatives that can strengthen the accessibility of successful practices. Striking a harmonious balance between effectiveness and economic feasibility ensures that these solutions not only remain inclusive but also stand within reach for a broader demographic. An equitable distribution of the economic burden associated with the implementation of these practices enhances their appeal and paves the way for wider adoption.

Moreover, the exploration of sustainable funding mechanisms becomes instrumental in ensuring the longevity and widespread availability of impactful practices. This involves strategic planning to identify sources of financial support that can transcend the initial phases of implementation, thereby sustaining the

accessibility of these solutions. Collaborative initiatives with governmental bodies, private enterprises, and philanthropic organizations can play a key role in sustaining the economic foundations of these practices.

In conclusion, the critical evaluation of impact, scale, and affordability allows us to pinpoint practices that not only showcase effectiveness but also hold the potential for pervasive adoption. By ensuring that these practices are economically sustainable and financially accessible, we lay the groundwork for the creation of Smart Healthy Age-Friendly Environments that transcend boundaries and positively impact diverse communities. The convergence of impactful practices with economic feasibility emerges as a cornerstone in the realization of overarching goals in fostering well-being across varied landscapes.

5. Conclusion

5.1 Summary of main findings

Matrix to synthesise existing knowledge and critically assess practices of inclusive design of innovative solutions for SHAFE.

User-centred design (UCD) focuses on the needs, wants, and limitations of end-users to create products or services that are useful, usable, and enjoyable. Inclusive design takes this approach further, ensuring that products or services are accessible to all users, including those with disabilities or other limitations.

The design of age-friendly environments and communities should incorporate both UCD and inclusive design principles to create spaces that are welcoming and accessible for people of all ages. In the context of age-friendly environments and communities, user-centered design focuses on ensuring that the physical environment, infrastructure, and technology are designed with the needs and preferences of older adults in mind.

Inclusive design of age-friendly environments and communities involves four key principles: **inclusion, accessibility, usability, and engagement**. Inclusion means designing spaces that are welcoming and accommodating for people of all ages and abilities, regardless of physical or cognitive limitations. Accessibility involves creating environments that are physically accessible and accommodating to people with disabilities. Usability refers to the ease with which people can use and interact with a space or product. Engagement is the process of involving users in the design process, ensuring that their needs and preferences are into account.

Environmental design thinking involves the use of design principles to create spaces that are aesthetically pleasing, functional, and sustainable. This includes everything from building materials to landscaping and lighting. Age-friendly environmental design should incorporate features that are easy to navigate, accessible, and safe for people of all ages.

Technology and infrastructure design thinking involves using technology and infrastructure to create spaces that are efficient, safe, and accessible. Examples include public transportation systems, accessible public restrooms, and digital wayfinding systems that help people navigate complex spaces.

Examples of user-centered inclusive design in age-friendly environments and communities can be found in various industries, including architecture, urban planning, and healthcare. For instance, architects can design buildings that are accessible and welcoming to people of all ages and abilities, incorporating features such as wide doorways, ramps, and clear signage. Urban planners can design communities that are walkable and

accessible, incorporating features such as sidewalks, crosswalks, and public transportation systems. Healthcare providers can design facilities that are welcoming and accommodating to patients of all ages and abilities, incorporating features such as accessible exam rooms, clear signage, and wayfinding systems.

There are several existing knowledge and practices in user-centered inclusive design of age-friendly environments and communities. For example, the World Health Organization's Age-Friendly Cities and Communities initiative provides a framework for designing and implementing age-friendly environments and communities that prioritize the needs of people at all ages. The initiative includes a set of eight domains, including outdoor spaces and buildings, transportation, and social participation, that are designed to help communities identify areas where they can improve the accessibility, usability, and engagement of their environments.

5.2 Key findings

The analysis of the WG1 Knowledge Base highlights several crucial insights regarding the user-centered design of age-friendly environments. These conclusions are drawn from a comprehensive examination of best practices, experiences, and implementations across Europe and beyond:

1. Holistic integration of physical, digital, and social dimensions

The research developed so far underscores the environment-centric nature of Smart Healthy Age-Friendly Environments (SHAFE) design. While human-space interaction remains a central point, there is a recognised need to broaden the perspective. This involves embracing the interconnected dimensions of digital and social aspects alongside the physical environment. This integration is key for creating a comprehensive and effective age-friendly environment that serves the diverse needs of its users.

2. Deepening understanding through individual dimension exploration:

Despite comprehensive studies and practices exploring SHAFE dimensions collectively, there is an identified need to examine deeper into each individual dimension of age-friendly environments. To achieve this, a broader engagement of citizens and end-users in the co-design and participatory phases is recommended. By involving the target demographic in the creation process, designers gain valuable insights into specific needs and preferences, ensuring a more nuanced and tailored SHAFE solution.

3. Data-driven design challenges and opportunities:

The analysis recognizes a lag in using big data and comprehensive data gathering methods for designing SHAFE solutions. To fully leverage the potential of technology, there is the need for advancements in data

analysis, particularly in understanding user behaviors within their daily life contexts. Addressing this gap is crucial for developing more informed and responsive solutions that respond to the evolving needs of the ageing population.

4. *Affordability as a key success factor:*

Affordability emerges as a critical success factor in ensuring the widespread adoption of SHAFE solutions. The analysis emphasizes the importance of creating technologies that are not only effective but also cost-effective. Additionally, these solutions should operate in a transcultural manner, considering diverse societal contexts. This approach facilitates scalability of adoption and ensures sustainability from both organizational and managerial perspectives. By making SHAFE solutions financially accessible and culturally adaptable, their benefits can reach a broader demographic, enhancing the overall impact on the aging population's quality of life.

5.3 Recommendations for the Module on user-centred and inclusive design

The main suggestions for the Module on inclusive design of NET4Age-Friendly derived from the work done so far within WG1 are the following ones:

1. *Holistic integration*

Digital inclusion: ensure that digital elements within SHAFE are designed with inclusivity in mind. Consider factors such as user-friendly interfaces, large font sizes, and simple navigation to accommodate varying levels of digital literacy among different individuals.

Social connectivity: integrate features that promote social interaction, such as virtual communities, social networking, or communication tools, to address potential isolation issues. Design interfaces that facilitate easy and intuitive social engagement.

2. *Individual dimension exploration:*

User-centric co-design: actively involve users in the co-design process, allowing them to contribute with insights into the specific needs and preferences related to each dimension of the SHAFE. Conduct participatory workshops, focus groups, and usability testing involving the target groups to ensure inclusivity.

Diverse representation: ensure diversity within the group engaged in co-design, representing a wide range of ages, abilities, and cultural backgrounds. This ensures that the insights gathered are reflective of the diverse experiences within the population.

3. Data-driven design:

Ethical data practices: prioritize ethical considerations in data collection, ensuring privacy and consent. Implement transparent communication about the purpose of data collection and how it will be used to build trust among older users.

User behaviour insights: use data analytics to gain a deeper understanding of the daily routines, preferences, and challenges faced by older individuals. This insight can inform design decisions to create more personalized and adaptive SHAFE solutions.

4. Affordability:

Cost-effective technology: focus on developing SHAFE solutions that are not only technologically advanced but also cost-effective. This could involve leveraging open-source technologies, promoting the use of existing affordable devices, and exploring scalable solutions that minimize economic barriers.

Cultural adaptability: consider cultural nuances in the design process, ensuring that SHAFE solutions are adaptable to diverse societal contexts. This involves understanding cultural preferences and norms related to technology use and incorporating them into the design to enhance user acceptance.

By incorporating these suggestions, experts can create more inclusive and effective SHAFE environments that address the multifaceted needs of people of all ages, fostering a sense of belonging, connectivity, and improved quality of life.

In conclusion, user-centered inclusive design of SHAFE involves designing spaces that are inclusive, accessible, usable, and engaging. This requires a multi-disciplinary approach that incorporates design thinking across various industries, including architecture, urban planning, and healthcare. By incorporating these principles, designers can create spaces that are welcoming and accessible for people of all ages and abilities, promoting social inclusion and enhancing quality of life.

REFERENCES

- [1] ADA.gov. The Americans with Disabilities Act (ADA) protects people with disabilities from discrimination.: Information and Resources Available from: <https://www.ada.gov/>
- [2] Carr, K., Weir, P. L., Azar, D., & Azar, N. R. (2013). Universal Design: A Step toward Successful Aging. *Journal of Aging Research*, 2013, 1–8. <https://doi.org/10.1155/2013/324624>
- [3] Centre for Excellence in Universal Design. About Universal Design. [Online]. Available from: <https://universaldesign.ie/about-universal-design>
- [4] De Vreede, T., Andel, S. A., De Vreede, G., Spector, P. E., Singh, V. K., & Padmanabhan, B. (2019). What is Engagement and How Do We Measure It? Toward a Domain Independent Definition and Scale. Conference: Hawaii International Conference on System Sciences. <https://doi.org/10.24251/hicss.2019.092>
- [5] Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services, Official Journal of the European Union, 151/70 OJ L (2019). <http://data.europa.eu/eli/dir/2019/882/oj/eng>
- [6] European Commission (2021). Commission Staff Working Document - Applying the Human Rights Based Approach to international partnerships. <https://wikis.ec.europa.eu/pages/viewpage.action?pageId=50108948>
- [7] General Services Administration. Section 508.gov. Available from <https://www.section508.gov/>
- [8] Georgakas, D. (2023). What is usability? In *Apress eBooks* (pp. 109–136). https://doi.org/10.1007/978-1-4842-9085-9_8
- [9] Global Diversity Practice. What is Diversity & Inclusion? [Online]. Available from: <https://globaldiversitypractice.com/what-is-diversity-inclusion/>
- [10] Gould, J.D., Lewis, C. (1985). Designing for Usability: Key Principles and What Designers Think, *Communications of the ACM*, March 1985, 28(3) <https://doi.org/10.1145/3166.3170>
- [11] IEEE. Available from: <https://www.ieee.org/>
- [12] Initiative, W. W. A. (2024). Developing websites for older people: How Web Content Accessibility Guidelines (WCAG) 2.0 applies. Web Accessibility Initiative (WAI). <https://www.w3.org/WAI/older-users/developing/>
- [13] Interaction Design Foundation - IxDF. (2016). What is User Centered Design (UCD)?. <https://www.interaction-design.org/literature/topics/user-centered-design>
- [14] International Electrotechnical Commission. Available from: <https://www.iec.ch/homepage>
- [15] International Organization for Standardization (ISO). About us. Available from: <https://www.iso.org/about-us.html>
- [16] ISO 9241-11:2018 (2018) Ergonomics of human-system interaction – Part 11: Usability: Definitions and concepts. Available from: <https://www.iso.org/standard/63500.html>
- [17] Javetski, B., & Koller, T. (2018). Debiasing the corporation: An interview with Nobel laureate Richard Thaler. McKinsey & Company. <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/debiasing-the-corporation-an-interview-with-nobel-laureate-richard-thaler>
- [18] Lara Gentilini (2021). Building Integrated Collaborative Relationships for Inclusive Learning Settings. <https://www.igi-global.com/dictionary/effective-and-efficient-practices-for-successful-inclusion-in-public-school-settings/14047>

- [19] Öztürk, N., Önel, H., Şener Küçükdoğu, M., Brown, J., Hizir Eryüzlü, I., Tse, L., Özalp, H., Koca, C., Parlak, B., & Öztürk, Ş. (2013). The Universal Standards Guide for Persons with Disabilities. WDU - World Disability Union. <https://worlddisabilityunion.com/images/contents/FILEdabfc04d877ef5e.pdf>
- [20] United Way of South Central Michigan. (2022). Accessibility: Physical and Programmatic. <https://unitedforscmi.org/day-8-accessibility-physical-and-programmatic/>
- [21] U.S. Access Board. Information and Communication Technology. Available from <https://www.access-board.gov/ict/>
- [22] Wikipedia (2016). Accessibility. [Online]. Available from: <https://en.wikipedia.org/wiki/Accessibility>
- [23] Wikipedia (2021). Universal design. [Online]. Available from: https://en.wikipedia.org/wiki/Universal_design
- [24] World Disability Union. (The universal standards guide for persons with disabilities) <https://worlddisabilityunion.com/images/contents/FILEdabfc04d877ef5e.pdf>
- [25] World Wide Web Consortium (W3C). (2021). Web Content Accessibility Guidelines (WCAG) 2.1. Available from: <https://www.w3.org/WAI/standards-guidelines/wcag/>
- [26] World Wide Web Consortium (W3C). Developing Websites for Older People: How Web Content Accessibility Guidelines (WCAG) 2.0 Applies. Available from <https://www.w3.org/WAI/older-users/developing/>
- [27] World Wide Web Consortium (W3C). Making the Web work Available from: <https://www.w3.org/>
- [28] Zola, I. K. (2005). Toward the necessary universalizing of a disability policy. The Milbank Quarterly, 83(4). <https://doi.org/10.1111/j.1468-0009.2005.00436.x>
- [29] World Disability Union. (The universal standards guide for persons with disabilities) <https://worlddisabilityunion.com/images/contents/FILEdabfc04d877ef5e.pdf>

ChatGPT, as an AI tool, was used to improve the recommendation framework based on identified stakeholders, which is further developed, and to identify additional well-being challenges, besides socio-economic previously identified.

ANNEX 1. – Knowledge Base

														LEGEND				
														Solution Excluded	Peer Evaluation Needed	Solution Included		
URL	DIGITAL /PHYSICAL/ ENVIRONMENT	CATEGORY	TITLE	TYPE	PRINCIPLES OF UCD	DESCRIPTION	SOURCES	INCLUSIONS (1-5)	ACCESSIBILITY (1-5)	USABILITY (1-5)	ENGAGEMENT (1-5)	IMPACT (1-5)	SCALE (1-5)	SUSTAINABILITY (1-5)	AFFORDABILITY (1-5)	TOTAL (8-40)	BP = Best Practice	COMMENT (Further development included)
1000	D		Educational game - Building Inclusive environments for all generations	User experience	inclusion	In this game the player meets 5 characters who face daily issues in life while they are pregnant, having mobility problems, suffering from dementia, suffering from adolescent identity issues and being a single parent. The aim of the game is to make every citizen happy by offering solutions for	https://www.big-game.eu/	5	5	3	4	3	5	5	5	35		The Big Game is a highly inclusive serious game, accommodating players with diverse needs. However, being an Erasmus Project, it is set to conclude in 2022, and further developments are not explicitly mentioned.
1001	D		Learning modules Hands-on SHAFE BUILT	User experience	inclusion	To learn to build inclusive environments we developed 7 online modules, including (among others) age-friendly house, dementia-friendly house, mobility outdoors.	https://hands-on-shafe.eu/en/built	4	5	5	4	4	5	5	5	37		The BUILT module of HANDS ON SHAFE project aims to enhance the quality of age-friendly physical environments, focusing on housing, public spaces, buildings, and mobility. It promotes social inclusion through training and practical tools, emphasizing universal design and the removal of physical barriers. The focus on creating safe, comfortable, and smart environments could positively impact the health of older individuals, potentially reducing social and healthcare costs. Sustainability is encouraged through easy maintenance. Further developments are not explicitly mentioned.
1002	D		Learning modules Hands-on SHAFE BUILT	User experience	accessibility	To learn to build inclusive environments we developed 7 online modules, including (among others) age-friendly house, dementia-friendly house, mobility outdoors.	https://hands-on-shafe.eu/en/built	0	0	0	0	0	0	0	0	0		The same as above
1003	D		Learning modules Hands-on SHAFE SMART	User experience	usability	To learn to use wearable devices and smartphones	https://hands-on-shafe.eu/en/smart	4	5	5	4	4	5	5	5	37		The SMART training package demonstrates a focus on delivering ICT training for facilitators engaging in the SHAFE economy, with an emphasis on smart healthy aging. While there are areas for improvement, such as providing more details on inclusivity, usability, and sustainability, the initiative shows promise in contributing to the use of IoT and mobile technology in supporting healthy aging. Future developments could benefit from additional strategies to enhance inclusivity, engagement, and long-term sustainability.
1004	D		Learning modules Hands-on SHAFE HEALTHY	User experience	inclusion	To learn a healthy lifestyle, dealing with therapies, dementia, chronic diseases or impairments	https://hands-on-shafe.eu/en/healthy	4	5	5	4	4	5	5	5	37		Hands-on SHAFE aligns with the WHO concept of health and focuses on adaptation and self-management in the face of various challenges. While the initiative covers a broad range of health-related aspects and emphasizes preventive measures, there are opportunities for improvement in providing more details on inclusivity, accessibility, scalability, and affordability.
1005	D		Age-friendly Cities and Communities Questionnaire (AFCCO)	User experience	inclusion	23 questions to measure how older adults perceive the age-friendliness of their city	https://erastnet.eu/en/agefriendlyworldoftheagefriendlycitiesandcommunitiesquestionnaire-afcco/	2	2	2	2	2	2	2	2	16		While the Age-Friendly Cities and Communities Questionnaire could be valuable for evaluation, it is an article and not a specific solution. Therefore, it should not be considered in WG1.
1006	D		Affordable age- and eco-friendly solutions to age in place	User experience	inclusion	Erasmus+ project to co-create with older adults the best solutions	www.afeco.eu	4	5	5	5	5	5	5	5	39		The AFECO project presents a well-rounded initiative with a strong potential for positive impact, particularly in engaging and empowering older individuals. The focus on a sustainable and affordable approach adds to its merits.
1007	D		Bridge the Gap!	User experience	engagement	Older adults learn digital skills by applying age-friendly environments and usability	https://bridgethegap-project.eu/	4	5	5	5	5	5	5	5	39		The "Bridge the Gap!" project demonstrates a commendable initiative to bridge the digital gap and empower older citizens for active participation in age-friendly environments. The focus on training, accessibility, and engagement aligns with the objectives of creating a positive impact.
1008	P	Organization	Dreamlike Neighbourhood	User experience	inclusion	Older adults group in neighbourhoods to exchange, learn and support each other	https://www.dreamlike-neighbourhood.eu/	4	5	5	5	5	3	5	4	36		The "Dreamlike Neighbourhood" project demonstrates a strong initiative to address the social needs of older adults by fostering supportive neighborhood groups.
1009	D		Educational game on Dementia care	User experience	inclusion	In the scope of IDO, an innovative game was designed to work around the standard ineffectiveness of traditional training methodologies for direct care workers. The game runtime, complexity and intrusiveness have been modelled and designed from the ground-up around the requirements and needs indicated by direct care workers, people with dementia, family carers, dementia experts.	https://ido-project.eu/game/	4	5	4	4	4	3	5	5	34		The IDO Care Serious Game is an engaging solution for caregivers, and it can teach them how to better assist people.
1010	D		Educational game on Handling lower back pain	User experience	inclusion	An innovative game was designed to work around the standard ineffectiveness of traditional learning approaches for mature workers. The required data was modelled and designed from the ground-up around the requirements and needs indicated by mature workers with low back pain and experts in the field.	https://myrelief.eu/03-mobile-serious-game/	4	5	5	4	3	4	4	4	31		The MyRelief Serious Game is an accessible solution that enables learning in a gamified manner. However, further developments are not discussed.
1011	D		Educational game on post stroke care	User experience	inclusion	An innovative game was designed to work around the standard ineffectiveness of traditional learning approaches for mature workers. The required data was modelled and designed from the ground-up around the requirements and needs indicated by mature workers with low back pain and experts in the field.	https://www.ustrain-project.eu/	3	4	4	4	3	3	4	5	30		The "TRAIN" Serious Game is an innovative solution for post-stroke care. It could be useful for caregivers to learn about the needs of a post-stroke person and how they can assist them. This solution, specifically, has a positive impact on learning, thanks to gamification that enhances engagement. However, further developments are not explicitly mentioned.
1012	D		MOOC on Dementia care	User experience	inclusion	This MOOC includes multimedia training contents for direct care workers, based on internationally recognized good practices in dementia care. The design and development of the MOOC contents involved direct care workers, people with dementia and family carers to include their perspective, therefore stimulating direct care workers to reflect on their daily practice and how to best meet their patients' needs.	https://www.udemy.com/course/training-on-dementia-for-direct-care-workers/	5	5	5	4	5	5	5	5	39		This MOOC on dementia care stands out for its inclusive approach, engaging multimedia content, and practical application through a serious game. It has the potential to make a significant impact on the daily practice of direct care workers.
1013	D		MOOC on Handling lower back pain	User experience	inclusion	The education of chronic pain patients and their relatives on self-management increases their self-confidence and improves their possibility to monitor, control and cope with the disease. This improves the patient's quality of life and reduces the physical and psychological symptoms. The main goal of this MOOC is to improve knowledge and skills of working adults regarding evidence based strategies that can help individuals manage their low back pain in all personal spheres (work, family, leisure etc.). But this course will show all the people that live with low-back pain and have a sedentary lifestyle or have arduous jobs how to self-manage their pain by adopting healthy behavior strategies. Learners will become more aware of their health and well-being, both at work and in the personal sphere.	https://www.udemy.com/course/self-management-strategies-for-people-with-low-back-pain/	2	5	5	3	4	4	5	5	33		This MOOC addresses a significant health issue, low back pain, with a focus on working adults. The emphasis on evidence-based strategies and healthy behavior adds credibility to the course. To enhance future developments, incorporating interactive elements, providing details on scalability, and ensuring regular updates based on emerging research could further improve the course's effectiveness and relevance over time.
1014	D		MOOC on post stroke care	User experience	inclusion	The daily working environments in which informal carers and direct care workers assist stroke survivors are highly demanding. Carers carry out most essential tasks, usually with high physical and emotional burden and with little specific training. The most commonly experienced challenge among carers is finding sufficient information on caring for a stroke survivor. This course will provide timely, reliable, and sound information and training to informal carers and direct care workers that will help enhance service provision and improve the stroke survivors' and carers' experiences and well-being needs.	https://www.udemy.com/course/training-direct-care-workers-dealing-with-stroke-survivors/	2	5	5	4	4	4	5	5	34		This MOOC addresses a critical aspect of stroke rehabilitation by targeting both informal carers and direct care workers. The emphasis on timely and reliable information aligns with the needs of the target audience. To enhance future developments, incorporating interactive elements, providing details on scalability, and ensuring regular updates based on evolving practices could further improve the course's effectiveness and relevance over time.
1015	D		Inclusive Design Canvas	User experience	inclusion	The Inclusive Design Canvas is a strategic design template that helps teams to ask the right questions and to embrace inclusion, diversity, equity and accessibility in the design process. With the Inclusive Design Canvas, teams can brainstorm more inclusive ideas and run co-design sessions by discovering peoples' journeys, their capabilities, their needs and turn challenges into opportunities with bespoke design actions. Break the blank page syndrome, download the Inclusive Design Canvas, and start brainstorming ideas and design.	https://idea.inclusivedesigntoolkit.com/idea-gui/	5	4	4	3	4	5	5	5	35		The Inclusive Design Canvas serves as a valuable strategic design template, encouraging teams to embrace inclusion and diversity in the design process. It provides a practical approach for brainstorming inclusive ideas, making it useful for understanding and generating solutions with a User Experience approach.
1016	D		IDEA Audit	User experience	inclusion	The IDEA audit is a mixed-method data collection and analysis tool that helps professionals and organizations to gather people's perception of inclusion, diversity, equity and accessibility. The IDEA audit helps teams to deeply understand the perceptions people have about inclusion, diversity, equity and accessibility in an organization or a specific environment and infer from data and insights future strategic design actions.	https://idea.inclusivedesigntoolkit.com/idea-stand/	5	4	4	5	4	5	5	5	37		The IDEA audit is a valuable tool for organizations seeking to understand and improve their inclusivity. It provides a structured approach to gathering data, allowing for comprehensive insights. To enhance future developments, providing more guidance on interactive use, scalability, and regular updates based on evolving practices could further improve the IDEA audit's effectiveness and relevance over time.

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https://www.it.toronto.ca/cz/edf/ta/vyzkum/prg/akty/ukonca/ta/vyzkum/prg/akty/	DIGITAL / PHYSICAL ENVIRONMENT	CATEGORY	TITLE	TYPE	PRINCIPLES OF UCD	DESCRIPTION	SOURCES	INCLUSION (1-5)	ACCESSIBILITY (1-5)	USABILITY (1-5)	ENGAGEMENT (1-5)	IMPACT (1-5)	SCALE (1-5)	SUSTAINABILITY (1-5)	AFFORDABILITY (1-5)	TOTAL (8-40)	BP = Best Practice	COMMENT (Further development included)
1072			Learning from COVID-19: Design, Age-friendly Technology, Hacking and Mental Models	User experience	engagement	Journal paper: Abstract: In March 2020 the United Nations published an open brief for the creative community to propose interventions to the unfolding COVID-19 pandemic. However, when faced with unprecedented wicked problems such as these, the rigour of design and creative processes can be tested. COVID-19 has demonstrated how important human centred design responses are in understanding the worldviews and ecosystems of users. Ad hoc design responses or design hacks have demonstrated that they have a role to play in how we create our future individual, community and societal ecosystems. In terms of age friendly design, this pandemic makes us envision what should be, furthermore, how we could create better products and services through technology. For our ageing communities 'Cocooning' and other social restriction measures have exposed technological deficiencies for the needs of older people and opens up questions of our future preparedness for a growing ageing society. Now more than ever, designers need to understand the behavioural mind-set of older people in their own ecosystem and understand existing mental models. In this opinion piece we posit what acts of design hacking can lead us to greater understanding of users mental models and therefore better understanding of technology needs for both older and younger adults. While presenting various examples of how design hacking is conducted by citizens and participants alike, it shows that it offers designers differing	https://emeraldopenresearch.com/articles/2211v1	5	3	3	4	3	4	4	4	30		
1073			"Who Doesn't Think about Technology When Designing Urban Environments for Older People?" A Case Study Approach to a Proposed Extension of the WHO's Age-Friendly Cities Model	User experience	engagement	Journal paper: Abstract: The World Health Organization (WHO) strives to assist and inspire cities to become more "age friendly", and the fundamentals are included in the Global Age-Friendly Cities Guide. An age-friendly city enables residents to grow older actively within their families, neighbourhoods and civil society, and offers extensive opportunities for the participation of older people in the community. Over the decades, technology has become essential for contemporary and future societies, and even more imperative as the decades move on, given we are nearly in our third decade of the twenty-first century. Yet, technology is not explicitly considered in the 8-domain model by the WHO, which describes an age-friendly city. This paper discusses the gaps in the WHO's age-friendly cities model in the field of technology and provides insights and recommendations for expansion of the model for application in the context of countries with a high human development index that wish to be fully age-friendly. This work is distinctive because of the proposed new age-friendly framework, and the work presented in this paper contributes to the fields of gerontology, geography urban and development, computer science, and gerontechnology.	https://www.mdpi.com/1660-4601/16/19/3526	3	3	3	3	2	3	2	2	21		
1074		Training	Age-Friendly Planning Built Environment Assessment Project, 2022	User experience	engagement	The project scope involved: • a demographic and population-based spatial analysis providing a snapshot of aging in Peel Region; • development of an Age-Friendly Built Environment Audit Tool, tailored to the context of Peel Region; • a current-state assessment of eight sample neighbourhoods with regards to age-friendly built environments; • consultation with seniors, caregivers, younger adults, and organizations serving seniors; and • recommendations to address gaps and opportunities discovered through the neighbourhood audits	https://www.peelregion.ca/officialplan/review/pdf/2022/AFP-Built-Environment-Assessment-Project-Final-Report-AODA.pdf	5	5	5	5	5	3	4	5	37		A little old (5 years ago) given how much things have changed since, and due to, Covid-19
1075			Age-Friendly Cities and Communities A global perspective	User experience	inclusion	Book in this book, part of the Ageing in a Global Context series, leading international researchers critically assess the problems and the potential of designing age-friendly environments. The book considers the different ways in which cities are responding to population ageing, the different strategies for developing age-friendly communities, and the extent to which older people themselves can be involved in the co-construction of age-friendly policies and practices	https://policy.bristoluniversitypress.co.uk/age-friendly-cities-and-communities	3	3	3	3	2	2	2	3	21		The project and report is based on the Peel Region in Canada that is home to 176,800 adults over the age of 65, 14% of the total population. Seniors also represent one of the fastest growing age groups in the Region, projected to grow to 20% percent of the total population by 2051. It is an example of preparedness for the future and assessment of the needs for other regions. The methods used should be considered to scale up in other regions and continents.
1076			Hearing aids for elderly people	User experience	inclusion		MISSING LINK									0		no link to assess. It should be disregarded from the evaluation
1077		Training	Making Healthy Places	User experience	accessibility	This project looks at such convergences and divergences within a particularly instrumental environment – the barriers and opportunities that present to built environment practitioners when making healthy places.	https://researchdirect.westernsydney.edu.au/islandora/object/1155950/datastream/PDF/view	5	5	5	5	5	5	5	5	40	BP	The researched is based on Australia in New South Wales and has a sample of the approximately 350 responses, a final sample of 221 were used in the analysis. The aim was to find a path on how do we go about creating places that help deliver positive health and wellbeing outcomes for all? There is a longstanding recognition that strategic policy and health promotions fall short in the implementation of healthy placemaking. As such there is an ongoing question about how to bridge the gap between the rhetoric of current healthy planning principles and the reality of what is being delivered and managed by practitioners on the ground. The survey and method applied could be replicated to other regions and help build the strategies for the future developments.
1078		D	Co-designing an Embodied e-Coach With Older Adults: The Tangible Coach Journey	User experience	usability	Guidelines for the design of an embodied virtual coach for seniors from the NESTORE H2020 project	https://www.landforline.com/dou/full/10.1080/10447318.2023.2171332	5	5	5	5	5	5	4	4	38	BP	The solution shows a good use of the technology employed and how to develop, test, validate and evaluate with the users. However in the line with the new technologies, this technology is not old and new technologies could be consider, but the methods could still be used as good practices.
1079			Covid-19 Pandemic and Its Effects on Social Life and Reflections on Spatial Preferences	User experience	accessibility											0		no link to assess. It should be disregarded from the evaluation
1080			Three Assistive Technology prototypes as clothing, furniture and footwear using E-textiles and wearable	User experience	usability	To make urban living for older adults easier, more independent, fashionable and comfortable	https://maturcife.eu/index.php/deliverables/									0		same project as below. Maybe it should be consider just one line?
1081		Training	Co-design/Co-creation with older adults and informal carers	User experience	inclusion	Interviews and co-creation workshops were conducted with older persons (>65 years) and their carers in Belgium, France, Germany, Italy, Poland, Slovenia, Spain, Turkey, and the United Kingdom.	https://maturcife.eu/index.php/2020/06/19/practical-maturcife-tips-on-co-creation-with-older-adults-and-informal-carers/	5	5	5	5	5	5	5	5	40	BP	The project is a good example of multicultural and interdisciplinary aspects that should be considered in the development and validation of the solutions.
1082			CA19104 Advancing Social Inclusion through Technology and Empowerment (a-STEP)	User experience	inclusion	COST Action to enhance social inclusion and empowerment of individuals with ASD and/or ID and their families	https://www.cost.eu/actions/CA19104/	2	2	2	3	2	3	3	3	20		The project website has no updates from 2021 and no deliverables to assess. This item should go back to the person adding it to fill in the information and maybe link documents to the assessment.
1083			The deployment of the Pharaon Large Scale pilots, assess, among other parameters, the usability level of the devices by the main users: Older Adults	User experience	usability											0		no link to assess. It should be disregarded from the evaluation
1084			ESSENSE - Higher education programme on building information modelling towards the development of smart environments for seniors.	User experience	accessibility											0		no link to assess. It should be disregarded from the evaluation

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URL	DIGITAL / PHYSICAL ENVIRONMENT	CATEGORY	TITLE	TYPE	PRINCIPLES OF UCD	DESCRIPTION	SOURCES	INCLUSION (1-5)	ACCESSIBILITY (1-5)	USABILITY (1-5)	ENGAGEMENT (1-5)	IMPACT (1-5)	SCALE (1-5)	SUSTAINABILITY (1-5)	AFFORDABILITY (1-5)	TOTAL (8-40)	BP = Best Practice	COMMENT (Further development included)		
https://www.it.tau.ac.il/~itau-cv/cv-wiki/xyz/kumbe/ekty/ukonca/te-xyz/kumbe/program			Use of sensors for monitoring biological signals and monitoring the health status of the elderly, namely in detecting falls indoors and outdoors.	User experience	usability		MISSING LINK											0	no link to assess. It should be disregarded from the evaluation.	
			Connecting at Local Level: Exploring Opportunities for Future Design of Technology to Support Social Connections in Age-Friendly Communities	User experience	usability	The paper discusses the challenges faced by healthcare and welfare systems due to the increasing number of older adults. It aims to explore how knowledge can contribute to the development of age-friendly cities and communities.	https://pubmed.ncbi.nlm.nih.gov/32751898/	3	5	5	5	4	5	3	5			35	This article describes a bottom-up approach to explore opportunities for facilitating social connectedness for older adults in a local community context -> citizen-engagement method composed of two phases (interview + workshop). The method described in this article could be replicated in other local communities.	
			How Can the Livid Environment Support Healthy Aging? A Spatial Indicators Framework for the Assessment of Age-Friendly Communities	User experience	usability	This paper presents a framework of spatial indicators to assess local environments based on the domains of Age-Friendly Cities and Communities (AFC). The framework can be applied within local neighborhoods, census tracts, suburbs, municipalities, or cities with minimal resource requirements other than applied spatial analysis.	https://pubmed.ncbi.nlm.nih.gov/33096773/	5	5	5	3	3	5	3	3			32	The major aim of this research was to propose a foundational set of objective AFC spatial indicators that can be applied in any location with minimal resources and are directly aligned for policy intervention. This is particularly relevant to planning and policymakers working in government and was neither previously available nor consistently applied within AFC locations.	
		Training	What makes a community age-friendly? A review of international literature	User experience	inclusion	The paper reviews the international literature on age-friendly communities and identifies key attributes associated with creating a sustainable environment for seniors. It critically evaluates emerging policy trends and models and suggests directions for future research attention.	https://pubmed.ncbi.nlm.nih.gov/31547204/		5	5	5	3	3	5	3	3		32	In this position paper, we aim to discuss the extent to which the model of age-friendly cities is suitable for application across Western smart and age-friendly ecosystems. We do so by examining existing models, taking a case study approach and exploration of technology through different scenarios. This paper will propose a contemporary up-to-date framework, whilst offering solutions, and recommendations, based on the individual (age-in-place) and secondly, from the societal perspective (age-friendly city). Furthermore, we provide an insight into a myriad of contemporary multi-disciplinary research which has the potential to initiate discussions and bring planners, scholars, health practitioners, educators, residents, developers, local, national and international governments together. This will in turn narrate future planning and development of age-friendly environments and housing in the coming decades.	
			Sensor for fall detection and prevention algorithms for behavior analysis	User experience	accessibility		MISSING LINK											0	missing link	
			VIREAS: Virtual Reality in Keeping Older Adults active	User experience	inclusion	A set of virtual experiences VIREAS (The Set) has been developed based on several tests and studies among care home residents. The Set contains three virtual experiences: "Walk through a Forest", "Walk through the City Center", and "Travel". The interactive design combines computer graphics and 360° pictures. The Set is designed to positively influence older adults' self-expression and self-confidence, motivate them and stimulate their curiosity. The Set allows older users, especially those in care homes, to see places they cannot visit in the real world and brings them new stimuli they can share with others. The software VIREAS is beneficial mainly in care homes as tool for keeping residents active. The conceptual manual Virtual Reality and Its Use in Care Homes and Beyond focus both on the technical matters of virtual reality use and aspects of the virtual experience, together with the procedures that will make it possible to fully replicate the experience.	https://vireas.cz/en/domu-english/	4	5	5	4	5	5	5	5	4			37	The VIREAS project is powerful, as it enables people of all ages, including those with disabilities, to enjoy the benefits of being in nature and walking.
			Effects of Virtual Reality Guided Meditation in Older Adults: The Protocol of a Pilot, Randomized Controlled Trial	User experience	usability	Virtual Reality (VR) based meditation has been shown to help increase relaxation and decrease anxiety and depression in younger adults. However, this has not been studied in Randomized Controlled Trials (RCT) in the older adult population.	https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1083219/abstract	4	3	2	1	1	2	1	1			16	study protocol article about VR used for meditation in older adults. it seems the project is still in development phase and so there are no informations about impact, scalability, ecc	
			Isolating together during COVID-19: Results from the Telehealth Intervention Program for older adults	User experience	accessibility	A pressing challenge during the COVID-19 pandemic and beyond is to provide accessible and scalable mental health support to isolated older adults in the community. The Telehealth Intervention Program for Older Adults (TIP-OA) is a large-scale, volunteer-based, friendly telephone support program designed to address this unmet need.	https://pubmed.ncbi.nlm.nih.gov/36304184/	5	5	5	5	5	4	3	5			37	Cannot access this one - paid version	
			Game not over: Explaining older adults' use and intention to continue using a gamified eHealth service	User experience	engagement	Thorough investigation of the reasons to use (or not) a gamified eHealth service by 55+ adults	https://journals.sagepub.com/doi/pdf/10.1177/14604582221106008	3	2	2	3	3	3	1	1			18		
			Designing eHealth that Matters via a Multidisciplinary Requirements Development Approach	User experience	usability	Specifying requirements in a way that truthfully translate the user needs is not a trivial task. In order to facilitate the creation of eHealth that matters, this article presents a practical, multidisciplinary requirements development approach which is embedded in a holistic design approach for eHealth that incorporates both human-centered design and business model.	https://www.researchprotocols.org/2019/1/e21/	3	3	5	5	5	3	3	3			30	The requirements development approach presented in this article enables eHealth developers to apply a systematic and multi-disciplinary approach towards the creation of requirements.	
			Smart, Age-friendly Cities and Communities: the Emergence of Socio-technological Solutions in the Central and Eastern Europe	User experience	engagement	The chapter aims to introduce an integrated approach to concepts of (1) smart cities and (2) age-friendly cities and communities. Although these ideas are widely promoted by the European Union and the World Health Organisation, they are perceived as separate. Meanwhile, these concepts are closely intermingled in theory and practise concerning the promotion of healthy and active ageing, a universal design, usability and accessibility of age-friendly environments, reducing of the digital divide and robotic divide, and reducing of older adults' social isolation. The conclusion underlines the need for participatory creation of ambient assisted living (AAL) technologies and applications with older adults and the need for advocacy to promote AAL in the context of the silver economy.	https://www.academia.edu/28374600/Smart_Age_friendly_Cities_and_Communities_The_Emergence_of_Socio_technological_Solutions_in_the_Central_and_Eastern_Europe	2	2	2	4	2	2	4	1			19		
			"One Health" Approach for Health Innovation and Active Aging in Campania (Italy)	User experience	inclusion	Campania's strategy for digitalization of health and care and for healthy aging is based on a person-centered, life-course, "One Health" approach, where demographic change is considered capable of stimulating a growth dynamic linked to the opportunities of combining the "Silver Economy" with local assets and the specific health needs of the population. The end-users (citizens, patients, and professionals) contribute to the co-creation of products and services, being involved in the identification of unmet needs and test-bed activity. The Campania Reference Site of the European Innovation Partnership on Active and Healthy Aging is a flexible regional ecosystem to address the challenge of an aging population with a life-course approach. The good practices, developed in the context of research and innovation projects and innovative procurements by local stakeholders and collaborations with international networks, have been allowing the transfer of innovative solutions, knowledge, and skills to the stakeholders.	https://www.frontiersin.org/articles/10.3389/fpubh.2021.658999/full	2	2	2	2	2	2	2	3	3			18	

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NO.	ENVIRONMENT	CATEGORY	TITLE	TYPE	PRINCIPLES OF UCD	DESCRIPTION	SOURCES	INCLUSION (1-5)	ACCESSIBILITY (1-5)	USABILITY (1-5)	ENGAGEMENT (1-5)	IMPACT (1-5)	SCALE (1-5)	SUSTAINABILITY (1-5)	AFFORDABILITY (1-5)	TOTAL (8-40)	BP = Best Practice	COMMENT (Further development included)
1088	DIGITAL PHYSICAL ENVIRONMENT		State of the art on ethical, legal, and social issues linked to audio- and video-based AAL solutions	User experience	inclusion	Ambient assisted living (AAL) technologies are increasingly presented and sold as essential smart additions to daily life and home environments that will radically transform the healthcare and wellness markets of the future. An ethical approach and a thorough understanding of all ethics in surveillance/monitoring architectures are therefore pressing. AAL poses many ethical challenges raising questions that will affect immediate acceptance and long-term usage. Furthermore, ethical issues emerge from social inequalities and their potential exacerbation by AAL, accentuating the existing access gap between high-income countries (HIC) and low and middle-income countries (LMIC). Legal aspects mainly refer to the adherence to existing legal frameworks and cover issues related to product safety, data protection, cybersecurity, intellectual property, and access to data by public, private, and government bodies. Successful privacy-friendly AAL applications are needed, as the pressure to bring Internet of Things (IoT) devices and ones equipped with artificial intelligence (AI) quickly to market cannot overlook the fact that the environments in which AAL will operate are mostly private (e.g., the home). The social issues focus on the impact of AAL technologies before and after their adoption. Future AAL technologies need to consider all aspects of equality such as gender, race, age and social disadvantages and avoid increasing loneliness and isolation among, e.g. older and frail people. Finally, the current power asymmetries between the target and general populations should not be underestimated nor should the discrepant needs and motivations of the target group and those developing and deploying AAL systems. Whilst AAL technologies provide promising solutions for the health and social care challenges, they are not exempt from ethical, legal and social issues (ELSI). A set of ELSI guidelines is needed to integrate these	https://www.academia.edu/66112088/State_of_the_art_on_ethical_legal_and_social_issues_linked_to_audio_and_video_based_AAL_solutions	1	2	2	1	5	4	3	3	21		
1099			State of the Art of Audio- and Video-Based Solutions for AAL	User experience	inclusion	It is a matter of fact that Europe is facing more and more crucial challenges regarding health and social care due to the demographic change and the current economic context. The recent COVID-19 pandemic has stressed this situation even further, thus highlighting the need for taking action. Active and Assisted Living (AAL) technologies come as a viable approach to help facing these challenges, thanks to the high potential they have in enabling remote care and support. Broadly speaking, AAL can be referred to as the use of innovative and advanced Information and Communication Technologies to create supportive, inclusive and empowering applications and environments that enable older, impaired or frail people to live independently and stay active longer in society. AAL capitalizes on the growing pervasiveness and effectiveness of sensing and computing facilities to supply the persons in need with smart assistance, by responding to their necessities of autonomy, independence, comfort, security and safety. The application scenarios addressed by AAL are complex, due to the inherent heterogeneity of the end-user population, their living arrangements, and their physical conditions or impairment. Despite aiming at diverse goals, AAL systems should share some common characteristics. They are designed to provide support in daily life in an invisible, unobtrusive and user-friendly manner. Moreover, they are conceived to be intelligent, to be able to learn and adapt to the requirements and requests of the assisted people, and to synchronise with their specific needs. Nevertheless, to ensure the uptake of AAL in society, potential users must be willing to use AAL applications and to integrate them in their daily environments and lives. In this respect, video- and audio-based AAL applications have several advantages. In terms of unobtrusiveness and information richness. Indeed, cameras and microphones are far less obtrusive with respect to the hindrance other wearable sensors may cause to one's activities. In addition, a single camera placed in a room can record most of the activities performed in the room, thus replacing many other non-vision sensors. Currently, video-based applications are effective in recognising and monitoring the activities, the movements, and the overall conditions of the assisted individuals as well as to assess their vital parameters. Assistive technologies including assistive robots (ATI/AR) appear to be a promising response to the increasing prevalence of older adults in need of care. An increasing number of long-term care facilities (LTCFs) try to implement ATI/AR in order to create a stimulating environment for aging well and to reduce workload for professional care staff. The implementation of new technologies in an organization may lead to noticeable cultural changes in terms of social interactions and care practices associated with positive or negative emotions for the employees. This applies especially for LTCFs with high rates of vulnerable residents affected by increasing care needs and specific ethics in nursing and cultural rules within the setting. Thus, systematic consideration in leadership management of emotions and ethical aspects is essential for stakeholders involved in the implementation process. In this article, we explicitly focus on the emotions of the employees and leaders within LTCFs. We relate to direct consequences for the organizational well-being and culture, which is of course (indirectly) affecting patients and residents. While aspects of technology acceptance such as safety and usefulness are frequently discussed in academic literature, the topic of emotion-management and ethical questions during the organizational implementation process in LTCFs received little attention. Emotional culture entails affective values, ethical norms and perceptions of employees and further investigation is needed to address the importance of transformational leadership during implementation process. For this purpose, we developed a three-staged assessment tool for implementation of ATI/AR in long-term care institutions. Acceptance (A), ethical acceptability (A) and emotional consequences (E) are considered as comprehensive assessment, in which emotional consequences comprise management aspects of transformational leadership (T), emotion-management (E) and organizational culture (O). Based on AAE and TEO, this paper presents an integrated framework illustrated with an illustrative example and aims to combine established approaches with ethical insights in order	https://www.academia.edu/74624978/State_of_the_Art_of_Audio_and_Video_Based_Solutions_for_AAL	5	3	4	3	3	3	3	3	27		This publication is based upon work from COST Action GoodBrother – Network on Privacy-Aware Audioand Video-Based Applications for Active and Assisted Living, supported by COST (European Cooperation in Science and Technology). This report provides the reader with a review of the most recent advances in audio- and video-base monitoring technologies for AAL. Future AAL technologies need to consider all aspects of equality such as gender, race, age and social disadvantages and avoid increasing loneliness and isolation among, e.g. older and frail people. Finally, the current power asymmetries between the target and general populations should not be underestimated nor should the discrepant needs and motivations of the target group and those developing and deploying AAL systems. These differences could lead to governance challenges, serious ethical questions, and potential misuse of the technology. Whilst AAL technologies provide promising solutions for the health and social care challenges, they are not exempt from ethical, legal and social issues (ELSI). A set of ELSI guidelines is needed to integrate these factors at the research and development stage.
1100	D		Implementation of Assistive Technologies and Robotics in Long-Term Care Facilities: A Three-Stage Assessment Based on Acceptance, Ethics, and Emotions	User experience	accessibility	Assistive technologies including assistive robots (ATI/AR) appear to be a promising response to the increasing prevalence of older adults in need of care. An increasing number of long-term care facilities (LTCFs) try to implement ATI/AR in order to create a stimulating environment for aging well and to reduce workload for professional care staff. The implementation of new technologies in an organization may lead to noticeable cultural changes in terms of social interactions and care practices associated with positive or negative emotions for the employees. This applies especially for LTCFs with high rates of vulnerable residents affected by increasing care needs and specific ethics in nursing and cultural rules within the setting. Thus, systematic consideration in leadership management of emotions and ethical aspects is essential for stakeholders involved in the implementation process. In this article, we explicitly focus on the emotions of the employees and leaders within LTCFs. We relate to direct consequences for the organizational well-being and culture, which is of course (indirectly) affecting patients and residents. While aspects of technology acceptance such as safety and usefulness are frequently discussed in academic literature, the topic of emotion-management and ethical questions during the organizational implementation process in LTCFs received little attention. Emotional culture entails affective values, ethical norms and perceptions of employees and further investigation is needed to address the importance of transformational leadership during implementation process. For this purpose, we developed a three-staged assessment tool for implementation of ATI/AR in long-term care institutions. Acceptance (A), ethical acceptability (A) and emotional consequences (E) are considered as comprehensive assessment, in which emotional consequences comprise management aspects of transformational leadership (T), emotion-management (E) and organizational culture (O). Based on AAE and TEO, this paper presents an integrated framework illustrated with an illustrative example and aims to combine established approaches with ethical insights in order	https://www.frontiersin.org/articles/10.3389/psyq.2021.694297/full	2	3	3	2	2	3	3	3	21		The article findings should be interpreted while considering certain limitations. The authors are aware that our AAE-model is initially a working hypothesis that deserves further development. Thus, a fourth or fifth essential perspective could be added to AAE as other acceptance logics could be applied. The ethical acceptability model could be given a different semantics than ours (humanistic-Christian-Kantian), i.e., utilitarian, anthroposophical, etc. In addition, the specific organizational context (funding principles, ethical codex, number and skills of employees and clients, number of residents with cognitive decline) plays an important role for the debate around the priority of robots vs. human care providers. In addition, leadership styles like transformational leadership can be taught to leaders by individual coaching or peer counseling, but it needs to be practiced and internalized, which takes time and support. Another limitation lies in the implementation of the model, which first of all means an additional effort (time, costs, intensity) for the management.

LEGEND
 Solution Excluded
 Peer Evaluation Needed
 Solution Included

ID	CATEGORY	TITLE	TYPE	PRINCIPLES OF UCD	DESCRIPTION	SOURCES	INCLUSION (1-5)	ACCESSIBILITY (1-5)	USABILITY (1-5)	ENGAGEMENT (1-5)	IMPACT (1-5)	SCALE (1-5)	SUSTAINABILITY (1-5)	AFFORDABILITY (1-5)	TOTAL (8-40)	BP = Best Practice	COMMENT (Further development included)			
1107	DIGITAL ENVIRONMENT	ByMaker - Game to teach children and youth about the sustainability in the cities and facilitate the engagement in the city planning.	User experience	engagement	ByMaker is a web-based game developed at NTNU to raise awareness among children and youth about the importance of balancing all three sustainability pillars, social, economic, and environmental in urban transformations. In the same time the game is showing the children how the city of tomorrow could be and how they can make sustainable changes and decisions.	https://www.by-maker.com/	THE SAME AS 108 (ALREADY EVALUATED)										0		It is the same as above	
1108		ByMaker - Game to teach children and youth about the sustainability in the cities and facilitate the engagement in the city planning.	User experience	inclusion	ByMaker is a web-based game developed at NTNU to raise awareness among children and youth about the importance of balancing all three sustainability pillars, social, economic, and environmental in urban transformations. In the same time the game is showing the children how the city of tomorrow could be and how they can make sustainable changes and decisions.	https://www.by-maker.com/	THE SAME AS 108 (ALREADY EVALUATED)											0		It is the same as above
1109		ByMaker - Game to teach children and youth about the sustainability in the cities and facilitate the engagement in the city planning.	User experience	engagement	ByMaker is a web-based game developed at NTNU to raise awareness among children and youth about the importance of balancing all three sustainability pillars, social, economic, and environmental in urban transformations. In the same time the game is showing the children how the city of tomorrow could be and how they can make sustainable changes and decisions.	https://www.by-maker.com/	THE SAME AS 108 (ALREADY EVALUATED)											0		It is the same as above
1110		Strong and steady are training groups adapted for seniors who experience unsteadiness	User experience	engagement	Strong and steady are training groups adapted for seniors who experience unsteadiness with incipient functional impairment who need balance and strength training. The new national recommendations for physical activity specify that elderly people with impaired balance, in addition to being physically active for 30 minutes at least 5 days a week, should do balance exercises and strength training to improve strength and balance and thus reduce the risk of falling. 60+ municipalities in Norway are using this programme	https://www.aldringsohelse.no/fysisk-helse/ager-mec-om-fysisk-helse/sterk-og-slodig/	1	1	1	1	1	1	1	1				8		courses to improve balance in order to reduce falls: not relevant
1111	D	Sense Garden solution and products	User experience	inclusion	SENSE-GARDENs are used in dementia care and combine virtual places, digital media and multi-sensory stimuli to create immersive environments adapted to the life story of the person with dementia. The SENSE-GARDEN Association facilitates cooperation between developers of technological solutions, offers support to the organizations in the health and care fields, facilitates discussions with users and user organizations, organizes voluntary activities around the SENSE-GARDEN idea	https://sense-garden.eu/association	5	4	3	3	5	2	4	1				27		Useful solution in community environments such as retirement homes, day centers or other entities that deal with people with dementia; also a sense garden home edition is envisaged. The solution is well centered on the person also using images, films or memories of the person itself. It seems that caregiver support is always needed to use the solution (usability) and there is a lack of information on affordability. No future developments are mentioned

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