Digital divide, smart assistive technologies and ageing people

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Abstract
Objective: To define the causes and potential solutions for the digital divide in the ageing population. Prior work: The digital divide between generations is somehow logical, because digital technologies evolved when today's elders were already retiring from professional activity. The pressure to use digital technologies comes later, when you need to monitor your functional and activity parameters, when you are isolated at home and have to talk to your family and your family doctor, when you need information in real time and the best source is the internet. Approach: Bibliographic research and case studies. Results: Digital assistive solutions progressed from assisting a function, increasing safety and the general level of activity, to improving physical, psychological condition and behaviour, then to solutions able to optimise task-oriented behaviour, then to enhancing social participation and now we talk about ecosystems and sustainability. The role of multidisciplinary teams implementing, in interdisciplinary approach, the principles of Physical and Rehabilitation Medicine and of the International Classification of Functioning, Disability and Health is crucial in developing such solutions. Implications: The stage we are now in is searching for the best solutions to find the friendliest interfaces, the easiest way to really implement smart in valuable feasible and sustainable services, but we are also searching ways to teach, train and coach the potential users of digital assistive solutions and for all other available ICT and sensor-based assistive technologies. Value: We go against the Cancel-Culture. In fact, we need to add two more domains to people's culture: the Active and Healthy Ageing Culture and the Digital Culture, and we need to make people aware of the importance of Ageing Well and of the fact that we are all relevant citizens of this imperfect society, where all lives matter.

Keywords: gerontotechnology, rehabilitation medicine, interdisciplinarity, age-friendly environment.

1. Introduction
In the context of world population growth, intense urbanisation, ecological and economy-related challenges, the implementation of Smart Cities seems the wisest solution. Smart Cities approach can help the metropole become living organisms, with its own real metabolism, a coordinating nervous system and immunity capabilities, able for self-sustenance and development [1].

Different solutions and integrated strategies are developed as we speak, granting the success of e-governance, e-education, assisted living, e-Health and digital health, cybersecurity and Information and Communication Technology (ICT)-based transportation [2]. But, the benefits of ICT, sensors and Artificial Intelligence (AI)-based technologies come with complications and with increased related costs.

One of the most important issues is related with the technologies themselves, with their usability, to be more precise. Such smart technologies require either skilful users, with enough ICT knowledge and abilities to manage all issues related to technology functioning and able to communicate with all complicated smart things in due time, or extremely friendly interfaces, designed to meet all their users needs and compensate all users' limitations – sensory, force, skill, coordination deficits, as well as emotional and cognitive limitations, in old users' case [3].

As smart technologies' development progress is exponential and learning to communicate with sensors and computers is a long and hard enterprise [4] as well as due to the fact that

human society needs also a lot of specialists in many other domains, with similar learning and experience long roads, the only way to manage usability is to increase technologies' interfaces user friendliness [5]. Due to the differences between perception, knowledge, areas of interest, strong and weak points of each category of users, developing older user-friendly interfaces is by itself a complicated endeavour. Designing and developing highly usable technologies require a special approach in the already classical user-centred development: participatory design, with the active involvement of all categories of the real future users.

The usability of digital assistive solutions is lower and lower as the potential users are more advanced in age. This is an important issue nowadays, when world population experiences an acute ageing trend [6]. Ageing population means increased levels of disability, frailty, higher burden on healthcare services and decrease of workforce available for care [7]. Smart technologies improves older people's quality of life, physical, emotional and social wellbeing [8]. Smart technologies may help older people live healthier independently for longer time at home, ageing in place, by empowering self-management of life and health condition and improving older users' efficiency in activities of daily living [9]. The whole healthcare systems are facing a change of paradigm and the new trend is the consumer-focused site of care, instead of centralised facilities for care, with already proven cost-efficiency [10, 11].

The digital divide between generations is somehow logical, because digital technologies evolved when today's elders were already retiring from professional activity. Today's elderly are part of the Baby-Boomers generation (born between 1946-1964), criticized in the media for their resistance to technological changes. The pressure to use digital technologies comes later, when you need to monitor your functional and activity parameters, when you are isolated at home and have to talk to your family and your family doctor, when you need information in real time and the best source is the internet. This pressure comes along with the societal need to reduce the burden upon the healthcare system and to decentralise at least a part of the healthcare services, the ones who better fit telehealth. Being healthy, active and living independently in your own home and ageing in place is a wish we all have, especially when we get older [12]. But for this, you have to reinvent yourself into a digital savvy person. Thus, digital divide, smart assistive technologies, smart cities and ageing people come together in discussion with concepts like Active and Healthy Ageing [13], Human Functioning [14] and Active and Assisted Living [15]. Built environments can be no only adapted to be age-friendly, but also designed to become smart environments for ageing well [16].

2. Objective

The objective of this paper is to define the causes and potential solutions for the intergenerational digital divide affecting the ageing population's capability of accepting and using smart assistive solutions.

3. Prior work

The digital divide between generations is somehow logical, because digital technologies evolved when today's elders were already retiring from professional activity. The pressure

to use digital technologies comes later, when you need to monitor your functional and activity parameters, when you are isolated at home and have to talk to your family and your family doctor, when you need information in real time and the best source is the internet. This research is based on concepts that come from the scope of several fields: rehabilitation medicine, geriatrics and gerontology, gerontopsychology, physical therapy and age-friendly architecture. These concepts have been applied in the last thirteen years in interdisciplinary research aimed at age-friendly environment [17, 18].

4. Approach

Bibliographic research in international databases and smart assistive technologies case studies from European Active and Assistive Living projects are used.

5. Results

Assistive technology is an umbrella term encompassing methods, devices, systems and internet of things-based solutions able to help users to perform successfully and efficiently tasks and activities of daily living [19]. These technologies (called also gerontotechnologies when designed to be used by older adults) involve sensor-based feedback, recommendations, alarms, reminders, monitoring and communication technologies. These should assist timely and as needed, being empowered by electronics and informatics to detect, monitor, report issues and anomalies, preventing hazards or assisting elaborated tasks [20]. Assistive technologies evolved from simple reminders to Smart Home Technologies. The aim of these technologies is to improve the quality of life of users, by helping them being independent in Activities of Daily Living (ADL) in a safe and efficient manner, helping users–ageing in place and empowering them to adopt behaviour changes in order to improve their lifestyle, for better health, mood, wellbeing, through optimised levels of activity and participation [21].

Digital assistive solutions for older people are aimed to meet the needs of ageing population in regards of independent living, a healthy level of activity and participation, while taking into account age related limitations, disabilities generated by comorbidities and frailty, as well as all kinds of environment-based facilitators and barriers.

Smart assistive technologies for older people progressed from assisting a function, increasing safety and the general level of activity, to improving physical, psychological condition and behaviour, then to solutions able to improve task-oriented behaviour, then to improve social participation and now we talk about ecosystems, about how all the Active and Assistive Living solutions can work together, how they can be implemented in real life systems and how they can be made sustainable. But, why to invent things nobody will use? How can we make those in need able and willing to use things which can bring them benefits?

5.1. Older people needs which can be assisted by smart technologies

A systematic review published in 2020 analysed results 26 systematic reviews on assistive technologies for older adults and from 537 studies and identified the main needs of older people which can benefit from assistance through technology [22]. These needs include compensation of deficits and limitations and assistance to ensure safety and to improve efficacy in activities of daily living (ADLs).

Deficits compensation in order to ensure functioning include: assistive technologies for sensory deficits (sight, hearing aids), for motor deficits and coordination (mobility and balance aids), cognitive support technologies (apps for language, memory, decision, space and time orientation, gamified cognitive training) and safety technologies for health-related issue (wearables for vital signs and movement and location monitoring for prevention and timely intervention support through technology).

Efficacy and safety in activities of daily living can be improved in the domains of self-efficacy in wellbeing (like apps stimulating and supporting behaviour changes to improve lifestyle), independent living (up to smart-home technologies), social connections and engagement. These cover indoor and outdoor activities, essential ADLs (smart kitchen, for example), professional activities and hobbies (also assistive tools for playing musical instruments), leisure activities (including assistive technologies for physical activity and sports) and communication (technologies to help connection with family and peers, as well as social robots). Researchers add to these categories also the need for medication management, mood recording and management, as well as the need for rehabilitation management (through apps as well as through telerehabilitation).

Smart solutions for the above needs include a large variety of low- and high-tech tools, stand-alone devices or IoT solutions, integrated in complex systems and services. These technologies can be wearables and dedicated apps – mHealth [23] or technologies embedded in smart environment [24].

5.2. Barriers in older adults' innovation adoption

Systematic reviews of literature found the main barriers in assistive technology (AT) adoption by older people: privacy doubts, trust, added value related questions, lack of ease of use, questionable suitability for daily use, lack of perceived need, fear of stigma, fear of dependence, lack of skills and training [25]. Other authors include here also lack of awareness and experience and decreased confidence in self-efficacy [26]. Reduced access to technologies, techno-complexity and techno-invasion related technostress and fear of not breaking the technologies are also barriers in innovation adoption by older people [27].

To increase the use of health and activity related technologies, one must understand and appropriate the relevance of health self-management for a good level of the quality of life (QoL). Old people have a general lower level of health literacy comparing with the general population [28], part of this issue being related to the access to health information and smart digital technologies, as a consequence of lack of knowledge and digital skills and low access to information sources, including internet, especially in south-eastern European countries [29, 30].

Technology reliability, very appreciated by older users, is not included in AT evaluation tools [31].

The Global Report on assistive technology published in 2022 emphasizes that most people in need of assistive technologies do not access it, due to lack of awareness, affordability, lack of services enabling the implementation of the AT, low quality of accessible AT,

supply channels related challenges. Living environment, the individual features of the disability and social-economic condition of the person come together with lack in policies supporting AT implementation [32].

Usability of smart assistive technologies and user behaviour are furthermore influenced by a series of personal factors: self-efficacy (which comes with experience, self-confidence, training and peer support), technology anxiety (related to previous frustrating experiences), trust in technology and in technology provider (including social and healthcare systems), privacy concerns, data protection concerns, perceived usefulness (related to health literacy as well as to digital literacy), social influence, functional and non-functional aspects of the technology and its interfaces [33] along with lack of technical and social support [34]. The above associate with negative general attitudes towards technology, including the basic functionalities of Smartphone and internet use (especially in south-east Europe). 2/5 of 65-74 years old population in Europe didn't use the internet in 2019, and only 7% of this population had above basic digital skills, using internet, internet banking, online shopping, paying taxes online, texting messages. Digital divide is lower in western Europe than in Eastern Europe. 75+ old people are the most exposed to social isolation, including due to lack of digital skills [35].

Social isolation itself and retirement from all social life and communication is a key factor for further distancing from the advances of technology and its use, the vicious cycle continuing with physical, emotional and cognitive decline [36]. Retirement from professional activity and losing connection with the accelerated progress in technology make the intergenerational gap in knowledge and skills increase even more.

All the above-mentioned factors are responsible for the intergenerational digital divide, all influencing and being influenced by the digital literacy level of the older potential smart-AT users and their user behaviour [37].

5.3. Facilitators of older adults' innovation adoption

Main positive determinants of innovation adoption by older users include: positive previous experiences, strong motivation due to the needs met, priority, perceived safety in regards of data and privacy, trust in provider and in the maturity and robustness of the technology, peer support, authority support, age-friendly design. All of the above are positively influenced by the level of digital literacy of the older user.

Assistive technologies with increased chances to be adopted by older users fall into two categories: technologies with extremely friendly interfaces, and technologies supported by services enabling and empowering older users to improve digital literacy and innovation adoption.

Some older adults do not see the association between assistive technology and their needs or don't priorities it, they must understand the value of these solutions in order to adopt and to use them [38]. Therefore, improving their level of health literacy, their knowledge of Active and Healthy Ageing benefits and positive psychology (to increase their self-esteem and to motivate them) would increase their efforts in adopting and learning new

technologies. Adopting a sanogenic lifestyle and preventing (or reducing) disability would not only decrease the burden on the healthcare system and on older people's families, but would also provide better mood, sense of coherence, activity and participation level of the older person, with improved quality of life for the whole community.

Smooth first encounters with friendly technologies can reduce the related technostress (including the techno-invasion and techno-complexity aspects) and improve adherence to digital health and smart technologies user behaviour [39]. Therefore, a well-designed methodology of introducing technologies to older people would improve the adoption of innovation by them. Providing potential users not only with comprehensive user manuals but also with related information and well-designed teaching programs improve the innovation adoption level.

The digital divide is decreasing while people benefiting from training in smart technologies in their formative years are getting older, but the differences in internet and digital technologies are still high between generations. In the European Union, 58% of older adults have internet service, compared to 74% of all households, only 40 % of older adults (55-74) use the internet, compared to 75% of the overall population. Romanian older adults participating in a survey stated that 97% responders use smartphone users, 77,5% use the smartphone only for audio communication, 10% use email, 2,4 of them post [40, 41].

Heuristics of complex systems designed for older users must be respected when designing technologies for this age category. Not only that the functionalities must be developed to meet real needs in steps acquirable by older people but the technologies must also meet the requirements related to non-functional aspects, like: compensating the user's limitations due to visual deficits, hearing deficits, motor and coordination deficits, perception, memory, executive functions and data processing deficits, cultural and generational specificity [42].

The user friendliness of the interface from the perspective of the older user include: buttons of at least 9.6 mm, simple and easy to do gestures (avoid up-down scroll or gestures involving more fingers), [43], good contrast, lack of shadows or Scharf effects, fonts of minimum 16px, to increase readability, common knowledge icons associated with short text, use non-competitional gamification to improve motivation and mood [44].

The heuristic principles for complex applications aim to ease the use of complex ICT for all users, no matter their age and digital skills, and include: visibility of system status (progress indicator, as a meaningful feedback), match between system and reality (in regards of logics and metaphors), user control and freedom (support to explore and recover from errors), consistency and standards (ease interaction by improving reaction time through routines in the organisation of the information on visual interfaces), error prevention functionalities (to smooth the experience and avoid frustration), enable recognition more than recall (assist memory), flexibility and efficiency of use, aesthetic and minimalistic design, help users recognize, diagnose, and recover from errors, help function and documentation [45].

Confidence in learning and self-efficacy in testing novelties improve willingness to learn and to adopt digital technologies [46, 47].

5.4. Case studies of smart assistive technologies from Active and Assisted Living Projects

Active and Assisted Living is a funding programme aiming to improve the quality of life of European older people and to increase industrial opportunities in the field of healthy ageing technology and innovation. The program provides funding for projects developed in multinational partnerships, with consortia including SMEs, research organisations and end-user organisations, in order to generate market-ready products and services for older people. The program ran more than 300 projects since 2008 and had its last call for proposal in 2023. AAL is co-financed by the European Commission (through Horizon 2020) and by the national funding agencies of 17 countries [48].

A side effect of participation in these projects is the development of interdisciplinarity, the generation and strengthening of international and trans-domain networks of smart assistive technology developers, industrial partners, healthcare and social experts, architects, old adults organisations, boosting the understanding of real needs of older users and developing solutions, concepts and new methodologies, some of these results being used to improve the interdisciplinary education of young specialists.

The paper presents shortly a few solutions developed by consortia including the authors, in AAL projects.

5.4.1. Solutions with very friendly user interfaces

These solutions allow older adults use advanced communication, information and assistive technologies surpassing the lack of digital literacy.

Here we find two approaches: solution recognises user and run the program and solution recognises user and initiate an interactive program.

SENSE-GARDEN aim was to create garden-like physical and virtual spaces, as environment for shared experiences used to improve mood and behaviour for older adults living with major neurocognitive disorders. The flow of personalised experiences, included passive immersion in beautiful sceneries to personalised memory lanes, space exploration associating cognition, emotion, space and time orientation with elements of physical exercise and gamified cognitive training accompanied by music, soundscapes and scents. The workflows are supported by media devices integrated in a IoT, all information being organised and offered to users in personalised sessions. The access to the personal workflows is done through RFID touchless ID recognition, when the older user wearing the bracelet is entering the therapy space or wants to change the type of experience by choosing another media device or computer screen by simply presenting the bracelet. Thus, the interaction between the user and the technical solution is very simple, the user can manage it no matter his level of digital literacy. The primary user is in control of the session. The intervention is designed in accord with individualised objectives and is conducted by the clinical psychologist or by a trained occupational therapist and the impact of the program on QoL, behaviour, mood and cognitive functioning of the primary users was

demonstrated in a series of cases [49]. During the COVID-19 pandemics, the same team developed a SENSE-GARDEN system version to be used at home, the intervention being integrated in a telerehabilitation session or used as stand-alone family-based social wellbeing intervention.

Architecture and interior design can facilitate the befriending of elderly users with smart technologies, by including them, from the beginning, in the design concept of the space – whether it is an apartment, a therapeutic salon as it was in the Sense Garden project or a space in a public building. Contemporary architecture is truly age-friendly when it includes, competitive, personalized and intelligent, assistive technologies.

CoachMyLife aimed at developing an ICT and computer-vision-based solution able to assist older users with subjective and objective minor cognitive disorders to manage independently their activities of daily living, by providing step by step guidance, when acknowledged by the user. The CoachMyLife team wanted to provide a local-based solution, to avoid any issues regarding personal data security and privacy. Therefore, computer vision was based was used not for explicit activity recognition per se (requiring big data processing capacity and access to and from external databases), but for implicit activity recognition (solution sensitive to the context). The system acknowledges the presence of the user in a certain space and a certain position. If that post is maintained longer than preset or learned as necessary for the task in that specific user, the solution initiates the interaction with the user, hailing the user and asking (text to speech) if the user is ok and if he/she wants to perform a certain activity. The communication is kept simple, the user answers to questions with simple yes or no. The system chooses the right path in accord with user's answers. If the user asks for help, the solution will assist with indicating each step in a preset workflow, in errorless learning manner, and will see if the user effected the steps of a certain activity one by one. The solution is still able to recognise two simple activities: eating (using a wearable with a position sensor) and drinking (using a dedicated mug, recognised by the computer vision capabilities). The solution also offers reminders and motivational quotes. After setting initially the system (by self or by a healthcare provider or a savvier family member), the solution requires simple interactions based on voice or a user-friendly visual interface, with very few functions. One very important strong point of the CoachMyLife solution is the fact that the solution initiates interactions and engages the user only when needed. No digital literacy required. A basic training will make the user proficient in using this solution at home. CoachMyLife technology has been validated in an extensive usability study run in Romania, Switzerland and Slovenia.

5.4.2. Solutions stimulating improvement of digital literacy of their users

These solutions help users increase their self-efficacy regarding the use of ICT and assistive technologies.

Here we find to approaches: solutions which empower user and demands improvement of skills and stimulate the search for information, and solutions which involve use of wearables and apps and involves users' coaching by specialised staff members of the organisation providing the service.

Smart Solution for Social Isolation – SI4SI aimed at providing older adults at risk of isolation a simple solution to improve social participation. Because social isolation has a lot of direct and indirect determinants, the solution designed is rather complex. It provides user a personal assistant app, showing vital signs, sleep quantity and quality and whatever data it receives and process from wearables and smart environment. This assistant was developed to help user improve his/her lifestyle and activity level in order to improve physical and psychological condition, self-confidence and energy, to be able to sustain a more active social life. Social participation is empowered by a second app, accessible from the assistant app, providing users with a safe and engaging channel of communication with selected social contacts (family members, peers with same interests, healthcare and social care providers, young volunteers willing to share and learn), as well as connect to social events recommended by the app. The navigation inside these apps is friendly but requires some skills one can get through exploration, try and error or following the steps indicated in comprehensive user guides. The solution is integrated in a service enabling a dedicated caregiver to monitor vital signs as well as anomalies appeared in physiological parameters and in activity routines, thus enabling timely intervention and constructive feedback to users and recommendations for more detailed investigations. The caregiver or social worker can also assess the quantity of social communication through the social app and address related issues.

These being said, the SI4SI solution user is in control, self-managing his own life and technology, but in a safe way, being monitored by a caregiver able also to help user overcome issues related to technology or health. The solution has been validated in a recent field usability study.

AGAPE aims to provide users with a very innovative service, trying to improve the digital literacy level of the older users through personalised coaching in regards of assistive technologies based on wearable sensors and digital interfaces. Users are made aware of the relevance of using smart things in order to self-manage active and healthy ageing. They are provided with wearables and apps and training and their interaction with technology is monitored.

AGAPE implements a comprehensive platform that facilitates Ambient Assisted Living (AAL). The platform has four applications, each specifically designed for four distinct kinds of end-users: older adults (AGAPE Assistant), informal carers (AGAPE Companion), AAL specialists (AGAPE Monitor), and wellbeing/health managers (AGAPE Eye). The AGAPE platform comprises four customised services: e-health literacy promotion, behavioural change service, lifestyle and health status monitoring, and social inclusion services.

Informative video and articles are supplied to enhance e-health literacy. Additionally, a coaching session is offered to older adults to facilitate the adoption of innovative technologies that can support Active and Assisted Living (AAL) by promoting behavioural changes. The lifestyle and health monitoring are achieved by the utilisation of several non-invasive devices. Finally, in order to foster social integration, a specialised messaging module that incorporates text, audio, and video communication is integrated into the platform. This module guarantees user-friendly functionality for elderly individuals.

All these services are provided either in-person or immediately through the AGAPE Assistant application and are closely supervised by an AAL expert using the AGAPE Monitor programme. The AGAPE Companion offers surveillance data on a particular elderly individual to their informal carer. Ultimately, the AGAPE Eye offered valuable perspectives on the broader AGAPE platform.

The Innovation Adoption strategy in AGAPE is designed to address and bridge the intergenerational digital divide by focusing on the unique needs of the ageing target group and their caregivers. Recognizing that older individuals may face challenges in adopting and using smart assistive solutions, the strategy employs a multi-faceted approach to enhance digital adoption within this demographic.

The quantitative branch of the strategy begins with a Digital Adoption questionnaire, allowing for a systematic evaluation of users' familiarity and willingness to embrace new technologies. This initial assessment serves as a foundation for creating a personalized service scenario, leveraging innovative devices such as wearables and smart technologies. By tailoring the service based on individual digital adoption levels, the strategy seeks to empower ageing individuals to comfortably integrate and utilize assistive solutions in their daily lives.

The behaviour-oriented aspect of the strategy further addresses the intergenerational digital divide by facilitating face-to-face interviews between the ageing population and professional coaches. These coaches act as guides, delving into the personal attitudes, preferences, and needs of the users. This personalized interaction not only helps in refining the service but also fosters a supportive environment, easing any reservations or hesitations related to technology adoption.

Moreover, the periodic follow-up meetings with the professional coach ensure ongoing support and allow for the adjustment of parameters as needed. This iterative process recognizes that digital adoption is a dynamic journey, and the strategy is committed to adapting to the evolving needs of the ageing population and their caregivers.

In summary, the Innovation Adoption strategy contributes to reducing the intergenerational digital divide by providing a user-centric, personalized approach. By combining quantitative assessments, innovative devices, and human-guided support, the strategy aims to empower ageing individuals and their caregivers, fostering a more inclusive and digitally connected community. AGAPE Project is ongoing.

6. Implications and value

Implementing AT in real life is not just a matter of design or older people willingness. There is a lot much more to do for this. The whole smart ecosystem must be prepared to empower older adults to perform this adventure [50]. Policies must be updated, to engage funding in AT co-design development, training and to decide upon the optimal way to provide AT to older adults [51]: to be recommended by the general practitioner, by the gerontologist or by the physical and rehabilitation doctor or the pharmacist, off the shelf, or offered to users in programs supported by the health insurance, in association with

training programs in community or in education institution – see the University of the third age [52], for example. Services (private but also public, state-run services) must be updated to enable support telerehabilitation and long-term care based on smart AT. Healthcare and social care staff must be trained to be able to manage these systems and the AT. Intergenerational relationships must be fostered and younger people must regain their respect and consideration for the older generations, their investment in the new ones and their wisdom and deeper understanding of what really matters in the world. This will reduce the distance between people and will increase reciprocity, including in matters of teaching and learning one from another.

Now we talk about a lot of communication channels and platforms able to integrate these solutions to offer users optimal experience and benefits, and we talk about the barriers and facilitators of innovation adoption at the level of all stakeholder categories, because technologically supported solutions, even the friendliest ones, need the user to acknowledge their need for them, and users must be able to understand the benefits as well as the way they can deal with these solutions.

The new technologies' usability level for primary user (older adult) as well as for secondary users (family and professional caregivers) is strongly influenced by the previous experience of the users with similar technologies as well as by cultural specificities, personal life priorities and personal attitudes [53]. Personal attitudes, interests and motivation are strongly influenced by the social support [54].

Older people with medical conditions appreciate technology which can provide them information (mainly the highly educated people) and means of easy communication with their medical case managers (especially low-medium education people). For high income educated older adults, wellbeing is a priority and technologies are more accessible and can help for health monitoring, prevention of complications, medication reminders [9].

COVID-19 pandemic brought mandatory isolation and showed us that we can adapt and accept new technologies, if the situation requires it. But not all of us. The ageing "digital immigrants", laggards in using internet and smart technologies, suffered the most and the digital divide grows deeper between them and the younger and proficient "digital natives" [55]. Social isolation "helped" the digital divide between old people and young people, even more, the older users lacking the support of their younger family members or social volunteers [29]. The elderly – as well as other age groups – spent more time at home and direct contact with the loved ones was reduced for safety reasons. Thus, the dwelling architecture received additional requests, requiring the inclusion of intelligent technologies to meet the new needs of comfort, health, maintaining communication and interactions.

Active and Healthy Ageing (AHA) concept of World Health Organisation (WHO) emphasizes the importance of "optimizing opportunities for health, participation and security" for improving the quality of life of people as they age. Health is viewed by WHO as the result of physical, mental and social wellbeing [56]. The determinants of AHA belong to multiple domains. These include diverse determinants such as: personal (biological and psychological factors), economic, health and social services, cultural and

historical, physical and built environment (including access to opportunities) and behavioural aspects. Education in youth, long-life learning and engagement in productive activities (physical and mental engagement as well) and social life decrease the risk of disability [56]. WHO's AHA takes into consideration the bio-psycho-social approach of the human being provided also by WHO, in the International Classification of Functioning, Disability and Health, which places activity as the central piece in the framework, activity ability and performance being influenced and influencing all the other components. Environmental factors contribute as barriers or facilitators to the activity and participation of the person [57].

We can improve old people's capabilities of using smart assistive technologies by influencing their personal factors (including their digital skills) or their environmental factors (including the technology itself) and empowering them to make changes in their own behaviour (including improving their lifestyle also by using specific assistive technologies). We can do this if we create the opportunity to use these technologies by increasing accessibility of these technologies, but also by improving health education, along with digital education, and by providing them community support, to increase motivation. We would also add here the importance of an age-friendly built environment that can facilitate the acceptance and friendship with smart technologies. Capability, opportunity and motivation are the three key factors supporting behaviour change, including lifestyle and interest and engagement in using smart assistive technologies [58].

So, the stage we are now in is searching for the best solutions to find the friendliest interfaces, the easiest way to really implement solutions in valuable feasible and sustainable services, but we are also searching ways to teach, train and coach the potential users of digital assistive solutions and for all other available ICT and sensor-based assistive technologies and related services. Because we move on fast forward, but we must leave nobody behind. This endeavour requires highly interdisciplinary team work and co-creation with real users.

The 2022 Global report on assistive technology comes with a series of recommendations aimed to inspire actions to support the improvement of access to AT as well as the usability of the AT: improve policies, ensure safety, efficiency and affordability of AT, improve the capabilities and capacity of the workforce involved in AT development, involve users in design, development, provision, monitoring and assessing AT use and impact, increase public awareness and reduce stigma associated to the use of the AT, improve evidence-based AT policies, invest in research, development, implementation and ecosystems, create enabling environments, include AT in humanitarian response to crisis, offer technical and economic assistance through international cooperation [32].

7. Conclusion

The users must be empowered to improve their digital literacy and so, their technostress level and digital technologies avoidance will be reduced. Technologies will require user-friendly interfaces and smooth user interactions with meaningful feedback, step-by step assistance based on errorless learning principles, a comfortable user experience and a lot of persuasive training and support from dedicated teams of younger experts. The role

of multidisciplinary teams is crucial in developing such solutions. The implementation of the principles of Physical and Rehabilitation Medicine, of the International Classification of Functioning, Disability and Health, Age-Friendly Architecture and of the concepts of User Centred Design, Participatory Design, in interdisciplinary approach, are mandatory to ensure the development of solutions with real value for older adults, families and professional social and healthcare providers as well.

We go against the Cancel-culture. In fact, we need to add two more domains to people's culture: the Active and Healthy Ageing culture and the Digital culture, and we need to make people aware of the importance of Ageing Well and of the fact that we are all relevant citizens of this imperfect society, where all lives matter.

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