AGEING AND TECHNOLOGIES

Creating a vision of care in times of digitisation

A paper for policymakers

Anne Meißner & Stephen McNair

Federal Ministry
of Education
and Research

Authors:	Prof. Dr. Anne Meißner, RN, MScN, Professor of Nursing and Care Organisation, Institute of Social Work and Organisation Studies, Head of Nursing and Care Organisation Cluster, University of Hildesheim, Germany
	Prof. Stephen McNair BA, MA Professor (Emeritus) of Education, University of Surrey, UK. Retired Chair of the Scientific Advisory Board, European Joint Programming Initiative "More Years, Better Lives".
Cover:	Joint Programming Initiative (JPI) "More Years, Better Lives" Anne Meißner Birgit Oelker
Design & Layout:	Birgit Oelker
Published:	2021

Table of Contents

Executive summary

The global population is ageing, and with it the demand for health and social care. However, the number of people working in the sector is not keeping pace with the change, and the people who have traditionally provided informal and voluntary care are under increasing pressure. This growing gap between need and resources presents a challenge to countries in Europe and beyond, and all are seeking care and support arrangements that are better adapted and prepared for the future. This policy paper is one outcome from a project which investigated these issues across a range of European countries.

There is evidence from research and practice that technology can help to meet the challenge. However, it is still rare to find good matches between the technology and needs, and many potentially useful technical solutions do not find their way to those who could benefit.

The reasons for success or failure of technologies in care are comparable if not the same in the participating countries. Expectations are often unrealistic; the range of products and services is too complex and diverse for people to have a clear overview; appropriate infrastructure (and especially broadband coverage) is often inadequate; and research and development projects sometimes focus more on "selling" a technology than understanding what care recipients and carers might need or prefer. There is a clear need for better information for users on the options, their costs and benefits, and there is also relatively little accessible research into the level and nature of technology use and its social impact.

The key recommendations are

A vision of good later life: Developments in technology and caring need to be seen in the context of a vision of good later life, as understood by those who receive care and those who provide it, and in a framework of human rights. **This matters because** while it is clear that technology can play an important part in improving the quality of life of older people, technological interests are sometimes prioritised over client needs.

Policy coordination: Governments should aim for better coordination of public policymaking. This should include not only the most obvious Departments – health and social care services - but also digital services, housing, transport, employment, vocational training and others. **This matters because** technological development is taking place on a piecemeal basis, and relevant government Departments and agencies are not always involved or coordinated. This leads to inefficient use of resources.

Consumer information: A service or agency is needed, ideally at European level, to undertake independent evaluation of the technologies and tools available, and use that to provide information in appropriate forms to government, organisations providing care, carers and older people themselves. **This matters because** although a great deal of relevant creative technological innovation is taking place in Europe, and it is difficult to establish what is available, what works, in what circumstances, for what groups of older people and at what cost. As a result, governments, care providers and older people themselves, risk making poor investment decisions, in the development of tools and their purchase, delivery and use.

Digital literacy: Governments should ensure that appropriate education is available to enable older people and their carers to confidently make use of the technologies available. **This matters because** older people are the least likely group to have developed digital skills, although their quality of life, and the efficient use of the services available, will increasingly depend on confident use of technologies. Carers must be included because, while they can be valuable in supporting older people in the use of technologies, they can also be a barrier when they lack the necessary digital skills themselves.

1   The challenge

Demographic, epidemiological and societal changes present challenges to all European countries. At the same time, digitisation is proceeding rapidly in all European countries, although with differing intensity and speed. With high expectations and hopes being placed on technical systems in health and social care, numerous innovations have been developed and piloted. However, for various reasons, many of these are not in regular use.

To maximise the current and future benefits of technological innovation in the field of care, the European Joint Programming Initiative on Demographic Change "More Years, Better Lives (MYBL) commissioned a review and synthesis of knowledge. The aim was to bring together national experts to develop a common vision of care, and explore what contribution new and emerging technologies can make to good later life.

The coordination of this "fast-track" project was funded by the Department of Interactive Technologies for Health and Quality of Life at the German Federal Ministry of Education and Research (BMBF), and operationally supported by its funding agency VDI/VDE Innovation + Technik GmbH.

2   The project

Eight member states of the JPI MYBL (Austria, Finland, France, Germany, Italy, Netherlands, Spain, Sweden) volunteered to nominate and fund experts to define a vision of good care and explore the role of digital technologies in supporting that, led by the German partners.

The process began with two workshops with the national experts from the participating countries, each of whom then wrote a national report, using a common structure. The findings from these reports were then presented to a group of stakeholders, who challenged and fine-tuned them. This policy paper provides a synthesis of the main findings. The comprehensive report is available as open access[1].

The national reports describe a wide range of technical innovations, including around 150 specific products. Products covered a range of technologies, including apps, robots, and digital services, but also Virtual Reality, GPS monitoring etc. Innovations addressed care-dependent people, informal and formal carers in all stages of care (preventive, curative, rehabilitative and palliative) and all kinds of impairment (cognitive, physical and mental), as well as broader issues of quality of life.

3   Understanding the complexity

Because terminology can be confusing, we begin by explaining some of the terms and concepts considered in this report.

---

[1] https://jp-demographic.eu/projects/ageing-and-technologies/

3.1   Age and ageing

For policy and statistical purposes, it is sometimes necessary to distinguish old people from the population at large. However, there is no general agreement about how to define when a person is, or becomes, "old". The age of 65 is often used because in many countries that marks the normal age of retirement. There are also definitions based on aspects of dependency and frailty. One recent prominent example is the definition of "persons at risk" from COVID-19 for all people older than 60. Some commentators have distinguished the "third" and "fourth" ages, where the former relates to active retirement, and the latter to a period of dependency. Others use chronological decades "septuagenarians" and "octogenarians", while another group distinguishes the "oldest old" as those in the final stages of life.

The important point is that for most purposes, chronological age is not a helpful category. Individuals age at very different rates, and although levels of dependency rise, in general, with age, this is not predictable. Some people of 80 are fitter than some at 50. This means that there is no chronological age when people can be expected to need care, and some never do.

However, there are some general patterns. The WHO World Report on Ageing and Health[i] describes ageing as a complex change process, including significant biological changes which lead, over time, to a gradual decrease in physiological reserves such as hearing, visual, functional or cognitive losses, an increased risk of many diseases and a general decline in the capacity of the individual. The ageing process is also associated with social changes, including shifts in roles and social positions. Social research shows that, as they age, people tend to choose more emotionally meaningful goals and to focus their lives more closely on those. Goals and preferences also change, they optimise existing skills rather than learning new ones and choose strategies to avoid limitations or to compensate for lost skills and to cope with everyday life. Technology can help with all these changes.

In considering the use of digital technologies in later life, it is important to recognise that they may be as important in promoting psychosocial growth, a meaningful life and wellbeing, as in making up for the losses in the process of ageing.

3.2   "Good later life"

If the aim of developing and using digital technologies in later life is to improve the quality of life it is important to define what "good life" might mean. This clearly begins with what each individual perceives as "good", and this may vary greatly between individuals. However, there is agreement in principle that quality of life is a multidimensional construct that requires interdisciplinary discussion from different perspectives.

Debates continue about how to measure the quality of older people's lives. This reflects individuals' diversity, capabilities and aspirations. It also reflects complex questions about the relative role of objective and subjective measurements, which do not always agree. For example, when a person becomes disabled, their reported subjective well-being typically drops, but recovers over subsequent months, often returning to its former level, despite the clear objective change in capability. In the same way, the objective distance from an individual's home to the nearest community facility is readily measurable, but this is not a reliable proxy for the individual's perception of how relevant it might be to their needs and aspirations.

There are three broad approaches to measuring quality of life. The "objective approach", measures external factors like physical or mental impairments. The "subjective approach" seeks to measure an individual's subjective interpretation of his or her life situation. Finally, the "functional approach" combines the first two approaches by linking subjective representations with objectively measurable resources. Although an understanding of quality of life as an individual phenomenon has now become socially accepted, the subjective component raises real problems, especially with older people with mental impairments.

One key framework is the WHO's Operational Framework for Healthy Ageing, which defines healthy ageing as "the process of developing and maintaining the functional ability that enables well-being in older age." This functional ability is determined by

- the intrinsic capacity of the individual (i.e. the combination of all the individual's physical and mental capacities, including psychosocial elements),
- the environments he or she inhabits (understood in the broadest sense and including physical, social and policy environments),
- the interaction between these.

The WHO is developing a toolkit to help governments to measure these factors consistently as part of the Global Decade of Healthy Ageing which began in 2020.

A further way of considering good later life is to approach it from the perspective of individual human rights. All European countries subscribe to the European Convention of Human Rights and the Charter of Fundamental Rights of the European Union (CFR) which derives from it. These rights are universal, but have different implications for older people, especially those experiencing disability and health constraints. The components of the Charter are:

Dignity – to be treated with respect at all times, with respect for privacy, and with the opportunity to live what they see as a good and meaningful life and death,

Freedoms – self-expression, mobility, safety and security, privacy and protection of data consistent with EU law,

Equality – access to adequate income, reliable and appropriate information, to transport, culture, and nature without discrimination on grounds of age, functional limitation, gender, sexuality, ethnicity, religion etc.,

Solidarity – contribute to and participate in the life and the decisions of the community (citizenship),

Citizens' rights – can participate in activities as desired (individual, and respecting others),

Justice – protected from all forms of abuse (physical, psychological, financial, neglect); with the right to express their views and a right to a fair hearing in the event of disputes about care.

This project is not seeking to adopt a single definition of a good later life. The national reports demonstrate that countries vary in how they define the principles, values and policy objectives which underpin practice.

3.3   Good care

Just as "old" is not as simple concept, neither is "care", and again terminology varies between countries, both in what is included, and in what institutional and legal frameworks exist to provide it.

In this report we understand care in a broad sense. Care can be informal or formal, and may be supported by technological innovations. Informal care refers to unpaid care provided by e.g. family, close relatives, friends, and neighbours. Formal care refers to paid care services of different kinds, provided in the home or in some form of institution. The training and qualifications of formal carers vary greatly between countries and settings. Formal care is provided by licensed professionals, registered nurses, social workers, medical doctors, occupational therapists, physiotherapists and unlicensed carers (who have usually received shorter training)[ii].

The formal care sector faces various challenges, including workforce shortage due to factors like low wages, low job satisfaction, and substantial physical and emotional demand, and negative images and reputation of formal care. In most countries a growing proportion of formal care is being provided by private sector organisations, for whom profit maximization is in tension with the needs of care and carers.

In Europe, the number of informal carers exceed those of formal carers, but they are often unrecognised by welfare systems, and informal caregiving can have negative influence on carers' physical and psychological health, particularly for those caring for people with dementia. In the long term, informal carers may experience burdens and need various forms of care and support themselves. A range of social changes is reducing the supply of informal carers and their willingness to play the role.

Because care is, by its nature, a person-related service, it is impossible to fully standardise, since it involves both task related skills and emotional ones. Emotional tasks can neither be regulated by contract nor standardised, and are also "endless": more attention can always be expected, demanded, or given[iii], and the result depends to a large extent on cooperation and mutual respect between the parties concerned, including individuals in need of care, relatives, dependants, or formal carers and, depending on the setting, others such as administrative staff[iv].

Bearing all this in mind, it is relevant in the field of ageing, care and technology not only to formulate which task-driven care activities can be taken over by technology, but also to discuss how it will impact the emotion-driven level.

3.4   Technology and social change

Confusion of terms

Discussion of technology and care is complicated by confusion over terminology. Although terms like "Ambient Assisted Living" and "Active Assisted Living"[v] are used, there is no uniform definition or classification for solutions and no common standards. The WHO refers to "eHealth", as "the use of information and communication technologies (ICT) for health"[2], while individual

---

[2] https://www.who.int/ehealth/about/en/

authors use the term to refer to almost all technical applications that are in any way related to health[vi]. The European Commission defines eHealth similarly to the WHO, as:

> "Digital health and care refers to tools and services that use information and communication technologies (ICTs) to improve prevention, diagnosis, treatment, monitoring and management of health and lifestyle. Digital health and care have the potential to innovate and improve access to care, quality of care, and to increase the overall efficiency of the health sector"[3].

This confusion of terms was evident in the workshop discussions of the present project, and suggest a real need to find a common language[vii], since language shapes reality.

However, since older people in need of care, and formal and informal carers, are usually looking for solutions to problems, rather than for types of technology, it is more important to classify innovations according to relevant needs, rather than type of technology, functionalities, or technical conditions. This approach could also lead to the elimination of stigmatising labels, such as "gerontechnology" or "care technology", which can lead to technology being rejected[viii].

It is therefore important that future development of policy and practice should begin, not with the technologies, but with the needs of older people and their carers, and this should be expressed in ways which make sense to the users.

How to identify needs – and choose the "right" technology

While the need to support a good later life for the individual should be paramount in any policy, it is important to recognise that older people receive care through a complex network of carers and agencies, and technologies may interact at a variety of points in those networks. Each individual in the network will have their own needs, abilities and wishes. Sometimes these will be in conflict with each other. The following table describes some of these.

Perspectives on need				
Older people	**Informal carers**	**Formal carers**	**Service providers**	**Tech companies**
▪ Fair & affordable access to help & care ▪ Information about opportunities for help & financing ▪ Someone to organise x, y, or z ▪ Someone to help with x, y, or z ▪ Someone to do x, y, or z ▪ well-being, psychosocial growth and a meaningful life	▪ Fair & affordable access to help & care ▪ Information about opportunities for help & financing ▪ Organise care within the relationship ▪ Get help within caring for the relatives or acquaintances ▪ Get help within caring for the informal caregiver itself ▪ well-being, psychosocial growth and a meaningful life for the relatives or acquaintances	▪ Organise care needs within organisational structures ▪ Get help with caring for clients ▪ Get help with caring for the formal caregiver ▪ well-being, psychosocial growth and a meaningful life for the client	▪ Optimise processes ▪ Minimise risks ▪ Improve quality ▪ Improve working conditions ▪ Generate a return	▪ Generate turnover and profit ▪ Planning security ▪ Security of investment

Table 1: Perspectives on need (following Meißner 2018, p. 5[ix])

---

3 https://op.europa.eu/de/publication-detail/-/publication/08e68564-67fe-11e9-9f05-01aa75ed71a1/language-en/format-PDF

In all cases, efficient and effective decision-making and action depends on a knowledge of technical systems and their possible applications, potentials and limitations, costs and availability as well as potential consequences. However, it is not easy to gain and maintain an adequate overview. Helpful technology can come from different areas. While "aids" in a narrow sense are typically sold by the specialised medical industry, systems for adjusting the living environment (like active lighting control) can be sold in do-it-yourself (DIY) stores, while communication aids (like mobile devices) can be available in electronics stores, and relevant apps are distributed via the Apple and Google app stores. Finding the appropriate solutions for a specific care issue can therefore be difficult and time-consuming[x].

To make good decisions about if, when and which technology is the best for their needs, users require digital literacy. Care professionals also need the ability to inform and educate recipients and carers about technology, and to provide appropriate advice to inform decision-making[xi]. In the institutional care context, the care provider will draw on the available options and must decide whether one of the available technologies should be used a) for this person in need of care and b) now, later, never or always. Given the fact that innovation and investment reflect different interests, it is even more important to consult all concerned parties when making decisions. Technology may also be able to provide appropriate education to support this learning for care professionals, perhaps through online learning programmes[xii].

When considering whether or not a technology is appropriate it is important to consider both the task driven (the "what") and the emotional (the "how") dimension and whether a technology solution is more appropriate than a human one. This is particularly important when interests may be in conflict, e.g. of the care recipient and the care provider. **It is also important to recognise that the relevance of a technological solution will always depend on the specific situation.**

Between hype and innovation

People have high expectations of the power of technology to solve problems and bring about radical social change, and this is as true in the case of care as anything else. However, expectations are often unrealised, and consequences are often misjudged.

In the care sector, technology often appears to be a simple solution to the socio-political challenges posed by demographic change, such as the growing number of people in need of care and the increasing shortage of skilled care workers[xiii]. However, expectations of new technologies are often exaggerated, because new things are fascinating for many ("shiny object syndrome"), and hopes for disruptive positive changes are more likely to appeal to us emotionally and are more widely disseminated than other messages. Factual information, on the other hand, is less emotionally appealing. Companies that develop new technologies often benefit from the fact that the possibilities of their products are overestimated. Optimistic assessments highlight the experience of pilot customers to facilitate the raising of investment capital. Such misjudgements are therefore economically useful for companies, which accordingly have no interest in counteracting them. Furthermore, information on new technologies, like the extent of take up or consumer satisfaction, is often difficult to verify, as the information required to do so is often protected on grounds of commercial confidentiality. As a consequence, (media) hype often arises around new technologies, in which the notions of what the technology can do are extremely far removed from what the technology is actually capable of[xiv].

In summary, it is important to enable innovation, but equally important not to overestimate benefits.

Complexity of the change process

Implementing technology in the field of ageing and care is inherently challenging. Although research has shown that much is known about e.g. technology adoption, accessibility, impact, care needs, processes, and participation necessities[xv], many technological products have not been adopted, are abandoned by individuals, fail to scale up locally or have not been implemented long term at the organisational level[xvi]. These are not simple technical issues. Adoption is affected by, at least, the following factors:

- Readiness of the technology itself (maturity)
- Knowledge mobilisation
- Acceptance by the participants
- Participant involvement in R&I
- Integration into existing care processes
- Regulation framework[xvii]

Our knowledge is still limited and a better understanding of the impacts of disruptions to sociotechnical interrelations is needed. The more factors we get to know and consider, the more likely is that the implementation will be successful and lasting.

A framework, known as NASSS (Non-adoption, Abandonment, Scale-up, Spread and Sustainability) was developed to explain individual beneficiaries' non-use of health technologies and challenges to the diffusion and sustainability of technology-based change processes in health care institutions[xviii] (Greenhalgh et al. 2017). The NASSS[4] framework has been well received in the English-speaking world within a short time and has been successfully applied in a variety of studies for the analysis of health and care technologies[xix].

4   Findings

All of the participating countries of this project face similar demographic, epidemiologic, and societal challenges, although the details differ, and different countries have taken different approaches to exploiting this potential. While there is agreement that technical innovations can help to address the change from traditional to new care and support arrangements, we also recognise that technology alone cannot solve the problems, and not all technologies are appropriate. The major findings are as following:

Consistency between care frameworks and technologies

Implementing technology in the field of ageing and care is inherently challenging, and the national reports in this project illustrate a diversity of challenges and approaches. Furthermore, the reports demonstrate that introducing technology in care is more than a simple technical issue, and the diversity of authorities and responsibilities make innovation in care more difficult. That

---

[4] NASSS stands for non-adoption, abandonment, and challenges to the scale-up, spread, and sustainability of health and care technologies

may explain one of the more significant findings: that programmes are often started with no overview of priorities and strategies on social change, and there is little evidence of projects having a clear view of the legal and operational frameworks that clearly define responsibility and accountability for the new technologies and their applications in each phase of the project. The lack of a clear link between digital strategies, ageing and care frameworks, and inconsistency between frameworks appears to lead to partial changes that do not always contribute to a greater whole or broader social change.

Although the project found evidence of a great deal of activity to address the demographic challenges and ensure the quality of care, we found no evidence of a coherent approach to innovation in the use of technologies in ageing and care in any of the participating countries. National approaches (legal and institutional) to ensuring quality of care for older people vary considerably. The approach to a particular need in a given country will often depend on whether the need is identified as relating to social welfare, healthcare, or rehabilitation. As a result, care services are managed by different authorities, resulting in inconsistent and inadequate provision. Furthermore, initiatives on ageing, care and digital developments are also coordinated (if at all) by different authorities.

All participating countries have recognised the importance of technologies in care, and most countries have some form of national digital strategy[5]. Finland developed the Hyteairo programme, which aims to speed up the utilisation of artificial intelligence and robotics, with a special focus on older people living at home. France has developed a roadmap to accelerate a digital shift in healthcare, while Germany has initiated a wide range of national research funding programmes, complemented by many political programmes, like the recent 8th Government Report on Older People ("Older People and Digitalisation") which includes specific recommendations. The Dutch report describes national knowledge and dissemination centres where innovations are showcased, while Italy also reports on programs and incentives to stimulate the development of technology in care. The Swedes have endorsed a common vision for eHealth and related strategies. However, although we have reported many initiatives, this is necessarily an incomplete snapshot, and a systematic and more detailed overview might provide greater insight.

However, it is clear that technological innovations are not widely or consistently used in ageing and care for the moment in all countries, which suggests that a fundamentally different approach is needed.

Strengthening informal care

Although there are far more informal carers than formal ones in Europe, the former often play an invisible role in welfare policy and systems. Most strategies reported in the country reports for this project relate only to formal care, and strategies for strengthening informal care are hardly mentioned.

By contrast, many of the products examined in the project address older people and informal carers, rather than formal care settings, and there are major problems in making knowledge about

---

[5] These are all described in the national reports, included in the full report, available online at https://hildok.bsz-bw.de/frontdoor/index/index/docId/1173

technological opportunities and financing options available to these target groups. **More effort is required to ensure impartial information is available on appropriate technological products, services and support for informal care, both to users and carers.**

Human rights

Respect for human rights is a key element of our vision of good later life and good care. Although all participating countries are committed to internationally agreed human rights standards, these are reflected unevenly and in different ways in their national frameworks and strategies. In some cases, when describing innovations, the national reports explicitly refer to human rights such as dignity or equality; and call for compliance with these rights in developments related to ageing, for example by avoiding using cameras and microphones, in order to secure the individuals' dignity and privacy. Elsewhere the description is more general: stating simply that the technology will respect older peoples' dignity. It is clear that continuous ethical vigilance and legal analysis are crucial, because certain uses of technology can undermine human rights standards. This study also suggests that some technical innovations are more consistent with human rights standards than others.

Although a range of international agreements are relevant, the circumstances of older people in need of care are rarely explicitly covered either EU-wide or internationally[xx] . This deficit creates challenges to the field of ageing and technology. The findings strongly suggest that the role of technology in securing human rights needs further reflection and exploration.

While care is socially and individually indispensable for many older people, the resources available to meet the needs are under pressure, from growing demand and labour shortages. The consequences can be seen in open and hidden working and care conditions which infringe the human rights of carers and care recipients[xxi], and there is currently no general agreement on the application of human rights to care. Consolidating the law in that respect would mean greater clarity for countries and for the resulting obligations and implementation strategies. One possible model would be the standards proposed by the European Network of National Human Rights Institutions (ENNHRI):

- equal access to care services
- affordability of care services
- choice of care service
- right to life
- freedom from torture, violence and abuse
- liberty, freedom of movement and restraint
- autonomy
- dignity
- privacy and family life
- participation and social inclusion
- freedom of expression, freedom of thought, conscience
- right to highest attainable standard of care
- adequate standard of living
- equality
- access to justice
- palliative and end-of-life care

While standards of human rights are necessarily set at an abstract level, they are interpreted at an individual level, and are impossible to fully standardise. In addition, the ability of technical systems to fulfil needs (and secure or undermine human rights) cannot be considered in general terms. Each technology must be defined in relation to a specific user group and a definite reference framework[xxii].

It is important to use the principles of human rights as a yardstick for good care, and to consider the implementation of technological change in the light of that, both in principle and in relation to particular care relationships.

Technological approaches

The national reports examined around 150 specific products, which collectively addressed a range of groups, specific care issues and needs. The project expert group developed the typology of needs below, as a basis for classifying technological innovations. The numbers of examples examined varied between the headings, and there appeared to be fewer products related to physical needs like nutrition management or personal hygiene. It is important to note that this does not claim to be a comprehensive review of what is currently available or in use (and it may not be possible to do this, given the diversity of technologies, needs and speed of change).

Examples to illustrate the variety:

- *Social isolation and loneliness:* products cover apps, tablets, robots or VR experiences. All have the aim to connect people or reduce loneliness, using a range of approaches. The Italian app MY SOLI ("Never Alone") e.g. aims to facilitate communication between relatives and those who live in retirement homes. Using a diary format, formal carers can make notes, post pictures, or video clips to update the family about their relative.
- *Personal hygiene:* products cover apps connected with personal services and also robots. Although they all have the aim to support peoples' personal hygiene, they use various approaches. The German LAUNDRY SERVICE APP e.g. offers standardised and digitally controlled laundry service, only for outpatients – like meals on wheels, but for laundry.
- *Nutrition management:* products cover robots and apps. All have the aim to support peoples' nutrition management, using a range of approaches. The French product AUXIVIA e.g. connects drinking vessels via Bluetooth to a monitoring platform, that analyses drinking patterns. This product helps family carers or carers in nursing homes to monitor hydration.
- *Personal safety and security:* products cover platforms, GPS technology, automatic lights, smart medicine dispensers, AI with sensors, or monitoring systems. Products address the need to feel safe and secure, especially if a formal carer is not available. The Finnish telecare solution NAVIGIL e.g. supports people with dementia by alerting a member of the care team in case of an emergency or if a change in their overall wellness trend has been identified. It sends an automatic alert with GPS data if the dementia patient exits a pre-defined zone. GPS location and activity monitoring features also enable the persons concerned to call for help by pressing a button. An automatic alert is also sent out in case of a fall or immobility due to loss of consciousness.
- *Behavioural and cognitive issues:* products cover interactive robot pets or instruments, a music therapy app, and audio-visual media. The Dutch TALKING PHOTO ALBUM e.g. is an audio-visual photo album that allows creating visual manuals/photo albums supported by audio. It is mainly used for reminiscence, but could also be used as an aid for people with early-stage

dementia to receive instructions for everyday life activities. Target groups are mainly old people living at home together with their dependants.

- *Mobility:* products cover e-bikes, interactive videogames, service platforms for requesting assistance, exergaming devices[6], and connected devices. The Swedish product SMARTCANE e.g. is a connected walking-stick based on AI. The stick reports unusual inactivity to carers and alerts family members.

Very few of the products identified in this project are in use in more than one country. And there was evidence of duplication within and between countries, where products had been produced to meet the same needs.

How to find products for a specific need?

Although the products have been classified by relevant needs, this is not a simple task, since complex technological products may, deliberately or unintentionally, address more than one issue or need. This may be one reason why theoretical models are rare.

The development of technology in care has been largely left to the market, which has created many relevant products, but we know little about how well they work, for what "customers" and in what circumstances. It is not easy to gain and maintain an adequate overview, and resources may be found in very different places, including medical sources, technology retailers, app stores and DIY stores. The search for technical solutions for a specific care issue can therefore be difficult and time-consuming. We need serious evaluation, against criteria based on individuals' needs, including impact on wellbeing, ethical, human rights, and cost criteria. We need to find a way of making this information widely available to policymakers, managers of care services and individual carers and care recipients. Technology magazines constantly do this for new technological developments, and in most countries, we have publicly available consumer information do this for washing machines, or restaurants, but no one does this for care technologies.

We need to develop an information and advice system to help potential "customers" to choose appropriate tools and technologies for their particular needs. An international platform of this sort could inform users, purchasers and researchers about availability, performance, target users and costs. It may be worthwhile to look at commercial models, like those in use on travel websites, to develop such a service, or it could be undertaken by a governmental or European body.

At present, technological innovations are not widely used in ageing and care in any of the countries, and it would appear that research and development projects are still too strongly oriented towards the technically achievable, rather than the needs of older people. Information on new technologies is often difficult to verify, as indicators like numbers of users and prices for some devices is commercially confidential. Even where the number of users has been published, little is known about the impact of the system, since it provides information on the number of systems sold, but not on those currently in use. Policymaking and research could be assisted by a survey of care recipients and their use of technology. This could be done by a new survey, or by incorporation into established regular surveys like the Annual German Statistics on Care ("Pflegestatistik").

---

[6] Digital games where players interact physically.

Financing costs

The national reports found no evidence of clear national strategies to support technology development for care in later life. The coverage and costs to users for certain technologies in care always seems to be an individual decision depending on the status of the patient, his or her income and the remit of Health Insurance systems. Sources of finance are fragmented, with origins in a range of fields from specialised medical industry, to do-it-yourself (DIY) stores, electronics stores or even app stores, and the principles for this split are not clearly defined.

Many of the reviewed technologies are start-up innovations, with the costs of R&D relying heavily on funding from health care and social welfare organisations (even when the end user is an individual). Until there is evidence for actual efficacy or cost-efficiency these public service providers are often only able to continue testing of prototypes if there is development funding available. Experience shows that it is vital to be clear about the end user perspective and the business model (willingness to pay) from the start. As a result, products being developed with R&D funding often end with a prototype.

Structural resources features

Some countries have incomplete broadband coverage, which suggests a need for bridging alternatives, such as technologies that rely on TV-based devices, to be systematically integrated in countries' approach.

Strategic collaboration

Given the strategic importance of technical innovations for care services, and the need to promote their dissemination and to evaluate their impact, it would be helpful if organisations concerned with the issue - older people in need of care, informal and formal carers, service providers, technology companies – and those requesting technologies (private and public institutions) come together to consider developments and develop coherent strategies. However, we found no evidence of such collaboration.

Research activities

To promote technological change, it is not only necessary to promote extensive research, but to use the findings to better shape it. However, the country reports show little evidence on the level and nature of technologies' adoption or of its social impact. Whereas technology is developing rapidly, user-oriented research seems to advance at a significantly slower pace, lagging behind the potential of technical innovations. This calls for more agile research methods.

Understanding what older people and carers of all kinds see as meaningful, care technologies is essential for developing products that people want to use. Additionally, understanding their digital literacy, their resourcefulness, and diversity as technology users, necessitates the involvement of users as experts in the entire technology innovation cycle. This finding complements those of earlier reviews that identified a general lack of reliable research[xxiii]. Better sharing of evidence is required, into what does not work, as well as what does work – as well as extensive international discourse to rapidly advance knowledge (in an effort to keep pace with technological developments), to avoid making already made mistakes and speed up social change.

Knowledge mobilisation

Users, care providers and policymakers need good information on technological innovations and their potential contribution to positive social change, but the reports identify several major problems in making knowledge about technological opportunities available. In all countries the product range is too complex and diverse to grasp a clear overview, and in none is there any systematic access to information on choices and costs. Furthermore, where technologies are not considered as medical products there is no independent evaluation to check that they ensure consumer protection and comply with the law, and with human rights. There is no independent authority rigorously to evaluate the products to assist consumers in understanding the offers available and their costs and assist in choosing between them. Since different groups require different types of information, more detailed information is needed than is available. Furthermore, the confusion of terms discussed earlier makes it difficult to compare, find or discuss approaches, and makes it difficult for concerned parties to find appropriate technology for their individual situation. Within decision-making digital literacy must also be considered.

Use and demand of technologies during COVID-19

The COVID-19 pandemic started when this report was being written, but the crisis has led to significant changes in the use of technology across all participating countries. A snapshot of perspectives of various countries has been collected here:

People in need of care and their carers, formal and informal, have been heavily affected by COVID-19. Restrictions on physical contact, for example, have affected them severely. This has created serious challenges to care practices as well to routines and resources, and in that regard to technology. For many older people and their dependants, it was their first time using digital applications such as video communication or messenger services to keep in touch with their loved ones or carers. In that respect, many municipalities and non-governmental organisations have developed local practices to support the activities and participation of older people, and during the pandemic, a number of digital solutions have been offered to older people, to care services and institutions. In Finland, a corona virus symptom checker was quickly added to a public service portal for assessing symptoms and offering guidance to services, and during the period of the COVID-19 lockdown, some companies loaned their products to older people, care services and institutions, e.g. CUTII (France). In France, the platform ENTRAIDE to build and share good practices (France) was created during the COVID-19 crisis. Germany reports that many new innovations are emerging, with IT companies providing video conferencing servers free of charge. One German company has offered webinars to support users of the company's product (ICHÓ) for care workers, free of charge during the COVID-19 crisis. In Italy, the ANCELIA device that aims to increase care processes' transparency and efficiency for management, carers and residents' dependants has been adapted to provide tools to prevent and limit the spread of COVID-19 inside nursing homes. In Sweden, which already had well developed digital healthcare resources, with video consultation as an option, the use of and demand for such services has risen tremendously. In general, since the COVID-19 crisis, online training and further education of various kinds is increasingly being offered, and this includes formal carers.

Above all, all countries reveal that as a result of COVID-19 the use and demand of technologies, in particular with regard to social isolation or loneliness has risen tremendously. Due to the speed of the outbreak and the need for a quick reaction, project implementation has been greatly

accelerated. At the same time, it is becoming apparent that some issues, like broadband coverage or digital literacy, that formerly have not received enough attention are suddenly becoming extremely relevant. However, while the pandemic may be stimulating rapid technical innovation and disseminations, there is no evidence of systematic evaluation of this impact, and further investigation of the impact on social change during the pandemic is of great interest.

5   Policy recommendations

Government (at appropriate levels) should

- Build stronger links between strategies and policies for digital development, ageing, care, and human rights. The coherence between them should be transparently demonstrated
- Define clearly what agencies are responsible and accountable for supporting and regulating the development of new technologies and their applications in relation to care
- Support the creation of an agency or service to provide impartial information about technologies in the care of older people, to include evaluation of the needs addressed, relevance to human rights, effectiveness, costs, and alternatives[7]
- Integrate bridging technologies such as TV-based services in national strategies
- Encourage interaction between different interests operating in the field such as older people in need of care, informal and formal carers, service providers, and technology companies
- Ensure that information on the use of technologies in care is included in national surveys[8] and consider developing a survey of how people in care are using technologies, as a component of existing surveys or as a freestanding exercise
- Integrate digital literacy systematically into basic training and further education for all kind of caregivers

Those funding research and innovation in care technologies for older people should:

- Focus R&I funding on client needs and intended social change rather than technologies
- Base funding of technologies in care on the needs of older people, ensuring that they conform to human rights principles
- Fund the testing of promising prototypes as the targeted markets have often no resources (be it personnel or finances) for this
- Fund cross-disciplinary and international research consortia to support the exchange of experiences in various disciplines and countries
- Fund research which develops methods and theory formation in the field of care technologies

Those undertaking research and innovation in care technologies for older people should:

- Engage end users from the earliest stage of development, to ensure that they understand what older people and their carers see as good life and good care, and how the technologies might enhance that

---

[7] Consider commercial models, like those in use on travel websites, as well as consumer information organisations
[8] such the Annual German Statistic on Care ("Pflegestatistik")

- Make better use of existing research findings
- Explain in each case how proposals relate to the human rights framework
- Ensure interoperability between systems
- Consider the development of appropriate products, services and support for informal carer

Providers of care services should:

- Support those in their care to develop appropriate digital skills to enhance the quality of their lives.
- Integrate digital literacy alongside health literacy in the basic training and further education for all kinds of carers

Final remarks

Digital developments matter, not principally for their technical impact, but the social change which they bring about. In making decisions on what to develop, adopt and disseminate the priority must be first the quality of life and human rights of older people and their carers[xxiv].

6   References

Andelfinger, V. P., & Hänisch, T. (Eds.) (2016). eHealth: Wie Smartphones, Apps und Wearables die Gesundheitsversorgung verändern werden (1. Aufl. 2016). Springer Gabler. https://doi.org/10.1007/978-3-658-12239-3

Astell, A. J., McGrath, C., & Dove, E. (2020). 'That's for old so and so's!': does identity influence older adults' technology adoption decisions? Ageing and Society, 40(7), 1550–1576. https://doi.org/10.1017/S0144686X19000230

BMFSFJ, & BMG (2019). Charta der Rechte hilfe- und pflegebedürftiger Menschen (No. 3BR06). https://www.bmfsfj.de/blob/93450/534bd1b2e04282ca14bb725d684bdf20/charta-der-rechte-hilfe-und-pflegebeduerftiger-menschen-data.pdf

Böhle F. (2013) 'Subjectifying Action' as a Specific Mode of Working with Customers. In: Dunkel W., Kleemann F. (eds) Customers at Work. Palgrave Macmillan, London. https://doi.org/10.1057/9781137293251_8

Böhle, F., Weihrich, M., & Stöger, U. (2015). Interaktionsarbeit gestalten: Vorschläge und Perspektiven für humane Dienstleistungsarbeit. Forschung aus der Hans-Böckler-Stiftung: Vol. 168. Edition Sigma. https://doi.org/10.5771/9783845268279

Dunkel, W., & Weihrich, M. (2010). Kapitel II Arbeit als menschliche Tätigkeit: Arbeit als Interaktion. In F. Böhle, G. G. Voß, & G. Wachtler (Eds.), Handbuch Arbeitssoziologie (pp. 177–200). VS Verl. für Sozialwiss. https://doi.org/10.1007/978-3-531-92247-8_6

ENNHRI (2017). Human Rights of Older Persons and Long-Term Care Project: The Application of International Human Rights Standards to Older Persons in Long-Term Care. http://ennhri.org/wp-content/uploads/2019/10/ennhri_application_of_human_rights_to_ltc_feb_2017.pdf

Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., A'Court, C., Hinder, S., Fahy, N., Procter, R., & Shaw, S. (2017). Beyond Adoption: A New Framework for Theorizing and

Evaluating Nonadoption, Abandonment, and Challenges to the Scale-Up, Spread, and Sustainability of Health and Care Technologies. Journal of Medical Internet Research, 19(11), e367. https://doi.org/10.2196/jmir.8775

Greenhalgh, T., & Abimbola, S. (2019). The NASSS Framework - A Synthesis of Multiple Theories of Technology Implementation. Studies in Health Technology and Informatics, 263, 193–204. https://doi.org/10.3233/SHTI190123

Krick, T., Huter, K., Domhoff, D., Schmidt, A., Rothgang, H., & Wolf-Ostermann, K. (2019). Digital technology and nursing care: A scoping review on acceptance, effectiveness and efficiency studies of informal and formal care technologies. BMC Health Services Research, 19(1), 400. https://doi.org/10.1186/s12913-019-4238-3

Krings, B., & Weinberger, N. (2017). Kann es technische Assistenten in der Pflege geben? Überlegungen zum Begriff der Assistenz in Pflegekontexten. In P. Biniok & E. Lettkemann (Eds.), Öffentliche Wissenschaft und gesellschaftlicher Wandel. Assistive Gesellschaft: Multidisziplinäre Erkundungen zur Sozialform "Assistenz" (pp. 183–202). Springer Fachmedien.

Kunze, C. (2020): (Nicht-)Nutzung, Transfer, Verbreitung und Nachhaltigkeit von Gesundheitstechnologien: Deutsche Version des NASSS-Frameworks. https://opus.hs-furtwangen.de/frontdoor/deliver/index/docId/6230/file/Kunze_2020_NASSS_framework_deutsche_Version.pdf

Kunze, C. (2021). Zwischen Hype und disruptiver Innovation: Neue Technologien als Treiber für Veränderungen in der Pflege. In A. Meißner & C. Kunze (Eds.), Neue Technologien in der Pflege: Wissen, Verstehen, Handeln. Kohlhammer.

Kunze, C., König, P. (2017). Systematisierung technischer Unterstützungssysteme in den Bereichen Pflege, Teilhabeunterstützung und aktives Leben im Alter. In: Hämmerle, I., Kempter, G. (Hg.), Umgebungsunterstütztes Leben: Beiträge zum Usability Day XV. Pabst Science Publishers.

König, P., & Kunze, C. (2021). Technikberatung für Pflegebedürftige und An- und Zugehörige. In A. Meißner & C. Kunze (Eds.), Neue Technologien in der Pflege: Wissen, Verstehen, Handeln. Kohlhammer.

Kydd, A., Fleming, A., Paoletti, I., & Hvalič Touzery, S. (2020). Exploring Terms Used for the Oldest Old in the Gerontological Literature. The Journal of Aging and Social Change, 10(2), 53–73. https://doi.org/10.18848/2576-5310/CGP/v10i02/53-73

Laslett, P. (1994). The Third Age, The Fourth Age and The Future. Ageing and Society, 14(3), 436–447. https://doi.org/10.1017/S0144686X00001677

Li, J., & Song, Y. (2021). Formal and Informal Care. In D. Gu & M. E. Dupre (Eds.), ENCYCLOPEDIA OF GERONTOLOGY AND POPULATION AGING: Includes digital download (pp. 1–8). Springer. https://doi.org/10.1007/978-3-319-69892-2_847-1

Manzeschke, A.; Weber, K.; Rother, E.; Fangerau, H. (2013/English Version 2015). (Results of a study) Ethical questions in the area of age appropriate assisting systems. ISBN 978-3-89750-169-0. This study was generated by order of VDI/VDE Innvation + Technik GmbH in the context of the accompanying research 'Age appropriate assisting systems' commissioned by the German Federal Ministry of Education and Research

Meißner, A. (2018). How can new care technologies support equality and well-being of older people? State-of-the-art Paper im Auftrag des BMBF als Grundlage für die Entwicklung europäischer Fördermaßnahmen im Rahmen der Joint Programming Initiative More Years Better Lives.

Meißner, A. (2019). Technologieeinsatz in der zukünftigen pflegerischen Versorgung einer alternden Bevölkerung. Pflege & Gesellschaft, 24(3), 260–274.

Meißner, A., & Kunze, C. (Eds.) (2021). Neue Technologien in der Pflege: Wissen, Verstehen, Handeln. Kohlhammer.

Oppikoffer, S., & Mayorova, E. (2016). Lebensqualität im hohen Alter - theoretische Ansätze, Messmethoden und empirische Befunde. Pflege & Gesellschaft, 21(2), 101–113.

Petersen, J., & Manzeschke, A. (2021). Soziale Akezptanz und ethische Angemessenheit. In Meißner, A. & Kunze, C. (Eds.), Neue Technologien in der Pflege: Wissen, Verstehen, Handeln. Kohlhammer.

RKI (2017). Gesundheitsberichterstattung des Bundes: Gesundheitliche Ungleichheit in verschiedenen Lebensphasen. https://doi.org/10.17886/RKI-GBE-2017-003

Wahl, H.-W., Tesch-Römer, C., Zank, S., Weyerer, S., & Heyl, V. (Eds.) (2015). Gerontologie - Einführung und Geschichte (2., vollständig überarbeitete Auflage). Kohlhammer.

[i] WHO (2015)
[ii] Li & Song (2021)
[iii] Meißner & Kunze (2021)
[iv] Böhle et al., (2015); Dunkel & Weihrich (2010)
[v] Kunze & König (2017)
[vi] Andelfinger & Hänisch (2016)
[vii] c.f. Petersen & Manzeschke (2021)
[viii] Astell et al., (2020)
[ix] Meißner (2018)
[x] König, & Kunze (2021)
[xi] Meißner (2018)
[xii] Meißner (2018)
[xiii] Greenhalgh & Abimbola (2019)
[xiv] following Kunze (2021)
[xv] c.f. joint workshops on ageing and technology (2017, 2018)
[xvi] Greenhalgh et al. (2017)
[xvii] Kunze (2021)
[xviii] Greenhalgh et al. (2017)
[xix] Kunze (2021)
[xx] ENNHRI (2017), p. 29
[xxi] Mahler (2020)
[xxii] Krings & Weinberger (2017)
[xxiii] Krick et al. (2019)
[xxiv] Meißner & Kunze (2021).