

AGEING AND TECHNOLOGIES

Creating a vision of care in times of digitization

Anne Meißner (Editor)
University of Hildesheim, Germany



Meißner, A. (Ed.) (2020): Ageing and technologies – Creating a vision of care in times of digitization. Results of a fast-track process of the Joint Programming Initiative “More Years, Better Lives”. <https://dx.doi.org/10.25528/051> (Open Access).

This report is published on the occasion of a fast-track process “Ageing and technologies: Creating a vision of care in times of digitization”, supported by the German Federal Ministry of Education and Research in the framework of the Joint Programming Initiative (JPI) “More Years, Better Lives”. In addition, participants and authors of Chapters are funded by their countries. It provides a synthesis of the main results of the project commissioned by the Joint Programming Initiative “More Years, Better Lives”.

SPONSORED BY THE



This document is available free of charge on the Internet as an electronic publication (Open Access) available at: <https://dx.doi.org/10.25528/051>

This work is licensed under the Creative-Commons-License „Attribution-NonCommercial-No-Derivatives 4.0 International“. More informations: <https://creativecommons.org/licenses/by-nc-nd/4.0/legalcode>

The Deutsche Nationalbibliothek (German National Library) lists this publication in the Deutsche Nationalbibliographie (German National Bibliography); detailed bibliographic data are available at <http://dnb.d-nb.de>.

Cover:	Joint Programming Initiative (JPI) “More Years, Better Lives” Anne Meißner Birgit Oelker
Design & Layout:	Birgit Oelker
Published:	2020

Foreword

Demographic, epidemiological and societal changes are challenges to which all European countries are forced to find solutions. In addition, the so-called “digital transformation” is taking place, with digitization 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. Whereas technology is developing rapidly, policy, research and practice are advancing at a significantly slower pace, lagging behind the potential of technical innovations.

To maximize the current and future benefits of technological innovation in the field of care, the Joint Programming Initiative “More Years, Better Lives – The Potential and Challenges of Demographic Change” has initiated a review and synthesis of knowledge, in the form of a “fast-track” project. Bringing in experts and stakeholders to collect available knowledge in a short time. This process aims to develop a common vision of care in times of digitization and explore what contribution new and emerging technologies can make to good life bearing in mind the critical role of care, health and welfare services as people age. This is designed to help guide policy development, resource allocation and research efforts in this field.

Acknowledging the limited duration of the fast-track process, from March to October 2020, a pragmatic approach was taken. The project focuses on a challenge-driven perspective. The target audiences of this report are hence decision-makers in research policy, social policy and labour market policy, researchers and research funders addressing ageing, health and social care and technology, and tech companies active in that context.

The coordination of the overall fast-track project has been 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. In addition, the participants and authors of Chapters are funded by their countries.

Table of Contents

Foreword	3
List of abbreviations	6
List of authors	7
Executive summary	8
1 Introduction to the project	10
<i>Anne Meißner & Angelika Frederking</i>	
2 Vision statement	14
3 Understanding the complexity of ageing and technologies	16
<i>Anne Meißner</i>	
3.1 Age and ageing	17
3.2 “Good later life” and “good care”	18
3.3 Technology and social change	21
4 Experiences, opinions, and stakeholder viewpoints	27
5 National reports	30
5.1 National report: Finland	33
<i>Matti Mäkelä & Katja Pulli</i>	
5.1.1 A brief introduction to the country	33
5.1.2 Contribution of technologies to care on specific issues	34
5.1.3 Summary	40
5.1.4 References	40
5.2 National report: France	42
<i>Fabrice Gzil</i>	
5.2.1 A brief introduction to the country	42
5.2.2 Contribution of technologies to care on specific issues	45
5.2.3 Summary	60
5.2.4 References	62
5.3 National report: Germany	65
<i>Anne Meißner</i>	
5.3.1 A brief introduction to the country	65
5.3.2 Contribution of technologies to care on specific issues	68
5.3.3 Summary	79
5.3.4 References	80

5.4	National report: Netherlands	83
	<i>Louis Neven, Hein van Hout, Franka Meiland, Maartje Vermeer</i>	
5.4.1	A brief introduction to care in the Netherlands	83
5.4.2	Contribution of technologies to care on specific issues	85
5.4.3	Summary appraisal of technologies in care in the country	102
5.4.4	References	105
5.5	National report: Italy	108
	<i>Cecilia Tomassini</i>	
5.5.1	A brief introduction to the country	108
5.5.2	Contribution of technologies to care on specific issues	112
5.5.3	Summary	120
5.5.4	References	121
5.6	National report: Sweden	123
	<i>Johanna Ulfvarson</i>	
5.6.1	A brief introduction to the country	123
5.6.2	Contribution of technologies to care on specific issues	126
5.6.3	Summary	137
5.6.4	References	137
6	Similarities and differences between countries	138
	<i>Anne Meißner</i>	
7	Policy pointers	148
8	References	152

List of abbreviations

AAL	<i>Ambient Assisted Living or Active Assisted Living</i>
AD	<i>Alzheimer's disease</i>
ADI	<i>Integrated Home Care Services (Assistenza Domiciliare Integrata)</i>
ADL	<i>Activities of daily living</i>
AMD	<i>Age-related macular degeneration</i>
APA	<i>Personal autonomy allowance</i>
B2B	<i>Business-to-business</i>
B2C	<i>Business-to-consumer</i>
BAGSO	<i>Federal Association of Senior Citizens' Organisations</i>
BMBF	<i>The Department of Interactive Technologies for Health and Quality of Life at the German Federal Ministry of Education and Research</i>
COPD	<i>Chronic obstructive pulmonary disease</i>
DIY	<i>Do-it-yourself</i>
ECG	<i>Electronic consumer goods</i>
ENNHRI	<i>European Network of National Human Rights Institutions</i>
FET	<i>Future emerging technologies</i>
GDP	<i>Gross Domestic Product</i>
ICT	<i>Information and communication technologies</i>
IGJ	<i>The inspectorate of healthcare</i>
IIT	<i>Italian Institute of Technology</i>
INRCA	<i>National Institute of Health and Science on Ageing</i>
IT	<i>Information technology</i>
JPI MYBL	<i>Joint Programme Initiative "More Years; Better Lives" – The Potential and Challenges of Demographic Change</i>
MEESTAR	<i>Model for the Ethical Evaluation of Socio-technical Arrangements</i>
MD	<i>Medical doctors</i>
NASSS	<i>Non-adoption, abandonment, scale-up, spread, sustainability</i>
NNA	<i>Network Non Autosufficienza</i>
P2P	<i>Peer-to-peer</i>
R&D	<i>Research and Development</i>
R&I	<i>Research and Innovation</i>
SALAR	<i>Swedish Association of Local Authorities and Regions</i>
TNO	<i>The Netherlands Organization for Applied Scientific Research</i>
ZIN	<i>The Netherlands Care Institute</i>

List of authors

- Dr. **Fabrice Gzil**, PhD, Île de France Ethics Forum (Espace éthique Île-de-France) and National Institute for Health and Medical Research (INSERM) / Paris-Saclay University, Centre for Research into Epidemiology and Population Health (CESP), Paris, **France**
- Prof. **Hein van Hout**, Amsterdam University Medical Center, Vrije Universiteit, Dept. General Practice & Medicine for Older Persons', the **Netherlands**
- **Angelika Frederking**, VDI/VDE Innovation + Technik GmbH, Berlin, **Germany**
- Prof. Dr. **Anne Meißner**, RN, MScN, Professor of Nursing and Care Organization, Institute of Social Work and Organisation Studies, Head of Nursing and Care Organisation Cluster, University of Hildesheim, Germany
- Prof. Dr. **Matti Mäkelä**, MD, Senior Medical Officer, Finnish Institute for Health and Welfare, Unit for Ageing, Disability and Functioning, Helsinki, **Finland**
- Dr. **Franka Meiland**, Amsterdam University Medical Centers, Location VUmc, Gerion, Amsterdam, the Netherlands; Meiland Training&Consult, Hilversum, the **Netherlands**
- Prof. Dr. **Louis Neven**, Avans University of Applied Sciences, Caring Society Centre of Expertise, Active Ageing Research Group, Breda, the **Netherlands**
- **Katja Pulli**, Master in Service Innovation and Design, Finnish Institute for Health and Welfare, Unit for Ageing, Disability and Functioning, Helsinki, **Finland**
- Prof. **Cecilia Tomassini**, Full Professor of Demography, Department of Economics, University of Molise, **Italy**
- Prof. Dr. **Johanna Ulfvarson**, RN, Associate Professor, Karolinska Institutet, Senior Adviser in Research and eHealth, Swedish Society of Nursing, **Sweden**
- **Maartje Vermeer**, Bachelor in Social Work, Active Ageing Research Group (GET-Lab), Caring Society Centre of Expertise, Avans University of Applied Sciences, Breda, the **Netherlands**

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 real challenge to countries in Europe and beyond, and all are seeking care and support arrangements that are better adapted and prepared for the future. Some people believe that digital technologies can contribute to the solution, but others are more sceptical, believing that practical and ethical challenges are too great.

Technological innovations will certainly not solve all the challenges in the area of ageing and care, but there is evidence from research and practice that they can make a real contribution. 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.

There are many reasons for this. 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.

This is the report of a project which investigated these issues across a range of European countries. It aimed to begin with the needs of older people, rather than with the technology. To achieve this, it defined a vision of what good care for older people (embracing both social and health care) would look like, before considering what digital technologies might (or might not) contribute to achieving this.

The overall vision is of good care as the range of services which enable older people and their carers to maintain good later life as they understand it, recognising the great diversity of older people. As a framework for analysing the relevance of the technologies, we took the rights defined in the European Charter of Fundamental Rights, which apply as much to those in need of care as to the rest of the population.

The project established clearly that a common international approach to this topic is possible. The reasons for success or failure of technologies in care are comparable if not the same in the participating countries, and all the national policy pointers follow a similar direction.

Policy should begin with what older people and their carers (both formal and informal) believe is good care, taking into account international human rights standards. The following policy pointers are designed to lead to this:

- Policy needs to focus more on what role technology can play in securing good care, and less on ways of applying the technology to people.

- Strategies for the introduction and implementation of technology in health and social care need to be integrated with other relevant national frameworks (including frameworks and policies for care, health, digitisation, and other issues).
- Policy development in this field should engage with a wider range of societal actors.
- Digital literacy should be systematically integrated into the basic training and further education of caregivers, both formal and informal.
- A national or European strategy is needed to provide independent and impartial evaluation of technologies available, their costs and benefits, to assist those in need of care, their carers and the managers of care systems and institutions.
- There is a need for strategies to improve the interaction between older people in need of care, informal and formal caregivers, service providers, technology companies.

This report is not primarily about technology, but about the lives of older people and their carers. The vision of good later life should inform all development, and innovation should be undertaken in partnership with older people themselves. We hope that this report will help towards achieving this.

1

Introduction to the project

Anne Meißner & Angelika Frederking

Project background and scope

With the support of the European Commission, the Joint Programme Initiative “More Years; Better Lives – Potentials and Challenges of Demographic Change” (JPI MYBL) was founded in 2010 to align national programmes and research on demographic change in Europe and beyond. In the course of the continuous updating of the Strategic Research Agenda of the JPI MYBL, the topic of new technologies in care was identified as a topic of high relevance in 2019.

Eight member states of the JPI MYBL (Austria, Finland, France, Germany, Italy, Netherlands, Spain, Sweden) volunteered to nominate and fund experts to create a vision of care in times of digitization in a fast-track process under the lead of Germany. The process was initially set up by two workshops involving national experts from the participating countries, who then wrote a national report on an agreed structure. While all national experts participated in the workshops, only six countries remained to write the final reports. The findings from these reports were afterwards presented to a group of stakeholders, who challenged and fine-tuned them. This report provides a synthesis of the main findings. This introductory chapter outlines the background of the fast-track process and the structure of the report.

Societal relevance

The global population, particularly in Europe, is ageing at an unprecedented speed and scale, while the proportion of young people is decreasing. In former years people lived five years after their retirement on average and their condition deteriorated swiftly. Nowadays it takes 15 years on average before retired people become care and support dependent, while in the meantime they evenly contribute to care. Thus, older people constitute an increasingly heterogeneous group with highly varying abilities and possibilities when it comes to demanding care and support. At the same time fewer people are working in the care and support sector, leading to growing personnel shortages, endangering the supply of care to those who need it.

These developments create a situation in which older people are making different and diversified demands on the care and support systems. The latter have often not yet adapted to the changes described above. The focus is shifting from disease and disability towards autonomy and connectivity, seeking new integrated arrangements that include housing, social participation and inclusiveness, income, safety, a mutual exchange between ‘getting care’ and ‘giving care’, etc. To cope with the rapid societal developments, a transition is urgently needed, from traditional care and support systems to new care and support arrangements that are better adapted and prepared for the future.

The expectations of technical systems are high, and many new technologies have been developed, piloted, or evaluated in the past to master the challenges described above. At the same time, there is no apparent widespread use of technical systems in care. Why is this so?

Background

This question was explored in a workshop by the Joint Programming Initiative “More years; Better Lives – The Potential and Challenges of Demographic Change” in August 2018. Twelve European experts

dealing with care innovations participated in the workshop. Three main reasons for non-adoption were identified: 1) socio-technical challenges, 2) knowledge mobilization and 3) ethical issues. Research gaps were sought out, and it was clearly revealed that the role of new technologies in “good” care and well-being has rarely been examined in research (Meißner, 2018). With these manifold challenges, it is an important task to ensure that the future of care is designed proactively rather than responding reactively. The overarching conclusion of the workshop was summarized thus: “(...) we must not expect technology to solve all of the problems. Technology can be an important component of an overall system if we are clear (...) what care (and support) we need from humans and technology. What is needed most is a common vision of care (and support) of the future, to become a focus for policy development, resource allocations and research efforts in this field” (Meißner, 2018: 11). This was the ultimate starting point of the subsequent fast-track process.

Approach of the fast-track process

The fast-track process was divided into two phases. The first phase involved gathering and synthesizing evidence, scenarios, policies or possible practices dealing with new care and support arrangements of the future, in short dealing with “good care” corresponding to “good later life”, the trends that form them, and the existing values and criteria for describing them. Each member state nominated and contracted a national expert to prepare a short report on that issue in their country. The national experts met twice, firstly to agree on a template and structuring questions for the national report and the countries’ perspectives on the topic, secondly to shape and compare findings, to discuss “good care and support” and how technologies contribute to that area. The second stage aimed to review how new technologies help, or could help, achieve the “good care” identified in the first phase. This second stage drew upon the expertise of older persons, families, professionals, politicians and regulators and in terms of understanding which technologies already exist and to what extent they match the values identified for “good care”. The participants represented national and subnational levels.

Due to COVID-19 and the pandemic outbreak all meetings were held virtually.

Following these meetings, the project leader appointed by the JPI produced a report summing up the three workshops. To make the complexity of ageing and technologies in care easier to understand, this report also highlights relevant topics and provides a concise overview.

Structure of the report

Following this introduction, **Chapter 2** provides the jointly gathered vision statement. It arranges the context for the whole project.

Chapter 3 describes the complexity of ageing and technologies in care. The main motivation for initiating this project was creating a vision of “good care” in times of digitization. Associated with this were general considerations and dynamic discussions of what is meant by “ageing”, “good later life” or “care” or rather “good care”. There is extensive academic literature on that topics and the purpose of this project is not to add to the literature. However, to enable the findings to be understood, it is

necessary to briefly illustrate some terms and concepts underlying ageing and care as well as significant aspects on the tech side.

Subsequently **Chapter 4** focuses on the stakeholders' perspective to take their most important unmet needs into account. This chapter relies mostly on the knowledge and practical experience of the stakeholders participating.

Chapter 5 includes six national reports. Each national report gives a brief introduction to the country, an inspiring impression of the countries' technologies, and a summary and appraisal of the countries' specific findings.

Chapter 6 provides an overview of the countries' assorted lines of action regarding the issue. This section highlights the considerable diversity and similarities between the participating countries.

The report closes with comprehensive policy pointers to help to guide policy development, resource allocations and research efforts in this field in **Chapter 7**.

2

Vision statement

The aim of this joint approach was to develop a common vision of care in times of digitization and explore what contribution new and emerging technologies can make regarding good care. A vision statement describes an ideal situation, which aim to achieve in the future and contains the most important objectives and strategies to reach it. This vision statement has been jointly developed in the workshops of this fast-track process:

The development, implementation and evaluation of technologies in care will be based on the extent to which they contribute to securing good later life as understood by older persons and their caregivers in all their diversity, and in conformity with internationally agreed human rights standards.

The vision does not claim to redefine good care or good later life, but rather focuses on the role that technology might play in good care and good later life. To achieve this vision, a wide variety of issues and challenges need to be considered that will be addressed by the following chapters. The final policy pointers are significant first steps and crucial for the realisation of the vision.

3

Understanding the complexity of ageing and technologies

Anne Meißner

3.1 Age and ageing

Although there are multiple definitions of age, there is no general agreement on the age at which a person is or becomes old. As it marks the beginning of retirement or entitlement to a pension, the chronological age of 65 years often pragmatically shapes the definition of older persons in European countries. The numeric classification of age groups which is used in statistics is often affected by aspects of dependency and frailty. One recent prominent example is the definition of “persons at risk” from COVID-19 for all people older than e.g. 60. The risk depends on underlying health conditions which indeed show some correlations with a person’s lifespan but cannot be interpreted regressively, i.e. as individual risks. Thus, the division into years in the form of annual sections does not constitute any meaningful group affiliation, as all cohorts, and particularly the age groups, vary due to their strongly heterogeneous abilities, capacities and environmental conditions (following JPI personal correspondence). Beside this calendrical category, age is primarily a social category. In fact, age is one of the most important social categories besides gender or skin colour. The social category of age can be divided into formal age limits (e.g. legal age or age limit provisions for motor vehicle drivers) and informal age limits (“in our heads” – e.g. one should not marry again at the age of seventy) (Wahl et al., 2015). However, a division into stages of life is also common (e.g. RKI, 2017). In the early seventies, Neugarten put forward the idea that older people are not one homogeneous group and that age stratification could be used to distinguish between the fit and those in need of help (Kydd et al., 2020). Laslett (1994) extended Neugarten’s distinction, introducing the concept of the third and fourth ages to describe an economically relevant group of older people. His change from the third to the fourth age was marked by the key factor of dependence and addressed the negative imagery (ageism). However, a recent literature review explored terms for the oldest old in the gerontological literature. Again, this review shows that there is a lack of consensus on the division of the “old” population into the oldest age and/or the fourth age. Rather, it is speculated that such divisions have served to shift age discrimination into old age. It is suggested to use terms for ten-year cohorts such as sexagenarians (60–69), septuagenarians (70–79), octogenarians (80–89) and so on (Kydd et al., 2020). But it remains to be clarified whether the recommendations made are appropriate. However, language shapes reality. Therefore, to enable people of all ages identifying technology contributing to their good later life (in need of care) and not to stigmatize technology in this matter, there is a need for consensus.

Beside the age and following the summarizing WHO World Report on Ageing and Health (2015) ageing is a complex change process. That process includes significant, e.g. biological changes. Over time, those biological alterations lead 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. That is, for example, shifts in roles and social positions. In response, older people tend to choose more emotionally meaningful goals and to associate few but relevant activities with them. They optimize 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, including the use of technology. Also, goals and preferences seem to change, as well as the

awareness of or means of coping with restrictions or limits. Some changes are triggered by such loss, others reflect the ongoing psychological development in old age, which allows a high level of satisfaction in later life despite limitations (summarized in WHO, 2015). However, the older people get, the more likely they are to need care of some kind. Nevertheless, old age does not necessarily mean a need for care. There is a high diversity and different images of age. In creating a vision of care in times of digitization, it is thus important to consider not just the technological approaches that make up for the losses in the process of ageing, but also those related to well-being, psychosocial growth and a meaningful life.

3.2 “Good later life” and “good care”

What parts are technical systems able to provide in care in later life is a question with high relevance. In this regard it is particularly necessary to examine what constitutes “good later life” as well as “good care”.

Good later life

Within ageing and care, quality of later life has become a key concept. An essential part of quality of life is determined by the individually perceived well-being. Well-being is usually divided into an affective and a cognitive-evaluative component, the latter affecting a person’s whole life or individual areas of life. Existing concepts of quality of life, however, differ considerably and are based on various requirements and assumptions. There is extensive academic literature on the “good” later life or quality of later life. This project does not aim to add to that literature. 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 measurement – especially about the relative role of objective and subjective measurements. Finally, subjective and objective means of measurement often tell different stories. 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. Likewise, the objective distance from an individual’s home to the nearest community facility is readily measurable, but not a valid proxy for the individual’s perception of how relevant it might be to their needs and aspirations (following JPI personal correspondence). Overall, there is agreement in principle that quality of life is a multidimensional construct that requires interdisciplinary discussion from different perspectives.

Various theoretical approaches have emerged from this discourse. Three main general strategies regarding different theoretical approaches for measuring quality of life can be differentiated. These are (1) the “objective” approach, which derives an individual’s quality of life from the external perspective, e.g. by measuring impairments; (2) the “subjective approach”, which measures an individual’s subjective interpretation of his or her life situation and, (3) the “functional approach”, which 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, this subjective component, which is characterized by individual expectations and demands, is being strongly

questioned. More recent approaches to measuring quality of life therefore give greater weight to functional criteria (c.f. Oppikoffer & Mayorova, 2016).

This project is not seeking to adopt a single definition of a good later life. Rather, the national reports briefly summarize any principles, values and policy objectives which underpin practice in their countries, and this summary report discusses differences and their significance. Overall, one key framework for this fast-track process is the WHO's Operational Framework for Healthy Ageing. Healthy ageing encompasses "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),
- and the interaction between these.

In addition, fundamental rights expand the notion of a good life. In this regard, the Charter of Fundamental Rights of the European Union (CFR) as a comprehensive framework is considered within a good later life. All European countries are committed to these, although each has its own legal frameworks, institutional structures, and priorities to achieve them. These rights are universal, but have different implications for older people, especially those experiencing disability and health constraints:

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.

Good care

Besides, there is extensive academic literature on care. Care is sometimes also described as "care and support". The linguistic differentiation is country-specific and seems to depend on varying aspects, such as the underlying law. Debates continue on care and "good" care. Here again, the project's purpose is not to add to this.

In this report we understand care in a broad sense. Care can be given by informal or formal caregivers services, and might be accompanied by technical 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. Standards for formal caregivers vary across countries. Formal caregivers include licensed professionals registered nurses, social workers, medical doctors, occupational therapists, physiotherapists and etc. Unlicensed direct caregivers who received short-time training also provide formal care (Li & Song, 2021). Self-care is also a kind of care. Figure 1 shows the underlying understanding of care.

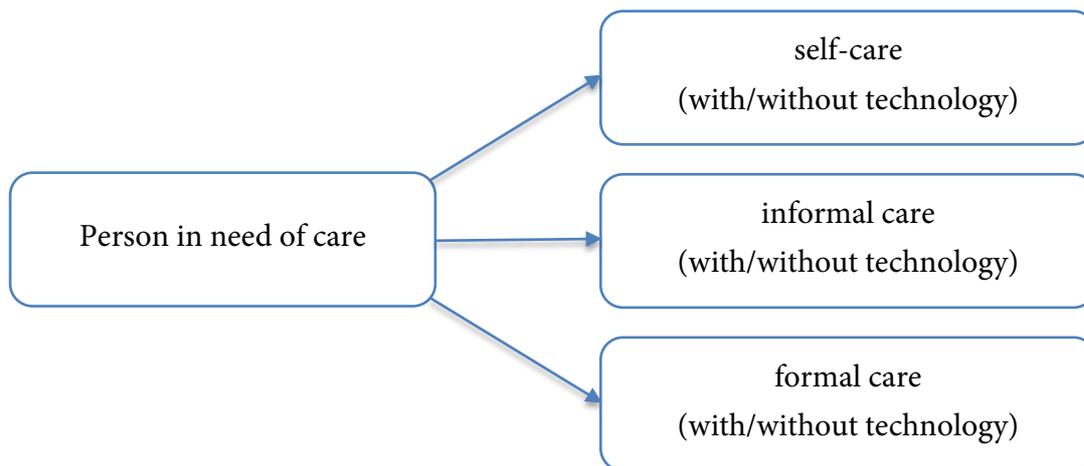


Figure 1: Broad understanding of care

The industry of formal care for older adults faces various challenges such as workforce shortage due to unsatisfying working conditions (e.g. high turnover due to low wages, low job satisfaction, and substantial physical and emotional demand, negative image and reputation of formal care). Due to a neoliberal shift in social care, private sector organizations are increasingly involved in the provision of formal care. It can be assumed, that the profit maximization is at the expense of those in need of care and of the caregivers. In Europe, the number of informal caregivers exceed those of formal caregivers but often play an invisible role in welfare systems. Besides, it is widely agreed that informal caregiving can have negative influence on caregivers' physical and psychological health. Informal caregivers for people with dementia are affected by a particularly large extend. In the long term, informal carers may experience burdens and need various forms of care and support themselves. The willingness and the potential of informal caregivers to support care, decreases constantly. Indeed, care for older adults has gone through a process of marketization, privatization, and deinstitutionalization (summarized in Li & Song, 2021). These facts underline the need for social change and the potential role that technology can play in ageing and care and are taken into account in the policy pointers.

Here, care is a person-related service. Person-related services follow the principle of simultaneous consumption and production; they are basically immaterial and impossible to fully standardize. Interactive work is part of every person-related service. Interactive work always has two levels: one is instrumental and task-driven (the "what" of the action), the other is emotion-driven (the "how" of the action). The levels are inseparable and always occur simultaneously. Type, weighting and intensity vary.

For example, it may be important for people to suppress their emotions, e.g. disgust or shame, or to explicate and reflect on them. Other emotions may also have to be revealed, e.g. friendliness, sincerity, gentleness. In addition, it may be important to recognize the feelings of those affected and to deal with them. Instrumental and task-driven care activities can apparently be operationalized, e.g. help with or information on something. Emotion-driven aspects, on the other hand, can neither be regulated by contract nor standardized, and are also “endless”: more attention can always be expected, demanded, or given (Meißner & Kunze, in Press). In principle, every type of personal-related care work is interactive work. Consequently, this relates to persons in need of care, and to formal and informal carers of all types. Within care, imponderables and the limits of planning must be dealt with continuously. Böhle (2013) calls this “subjectifying action”. Finally, the result depends to a large extent on cooperation between the parties concerned, including persons in need of care, relatives, dependants, or formal carers and, depending on the setting, others such as administrative staff. Mutual respect is a prerequisite (Böhle, Wehrich & Stöger, 2015; Dunkel & Wehrich, 2010). Care activities which require participants to live in close contact are made particularly stressful by these characteristics of interactive work. **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.** Further, the use of technology can have an impact on all forms of care. Depending on the grad of adoption technology may support as well as prevent or delay “good” care.

3.3 Technology and social change

The topic of ageing and technology was taken up several years ago. In February 2017, three European initiatives, the Active and Assisted Living (AAL) Programme, the Joint Programming Initiative on Demographic Change “More Years, Better Lives” (JPI MYBL) and COST, European Cooperation in Science and Technology – held a joint workshop on “Ageing and technology” to explore technology’s contribution to the management of demographic change, and especially the role of ICTs in the second half of life. The focus on this “Ageing and technology” initiative was on older persons in general but not specifically on care in ageing. The aim of this initiative workshop was ambitious: to understand better what is already known, about these issues, what technologies and solutions already exist, and where the focus of research, innovation and development might best be focused. Three workshops were undertaken in parallel regarding acceptance, accessibility, and impact. The participants identified key issues to inform research and development, several issues related specifically to the design of ICT solutions and thirteen priorities for research and development. The findings shall not be repeated here. More details are available in the final report¹. This workshop identified currently underexplored areas indicating that more attention should be paid to the specific needs of informal and formal carers as well as of those persons in need with cognitive decline or in institutional contexts. This in turn has for example been taken up in the “Equality and Wellbeing” programme run by JPI MYBL, the initiative mentioned in the introduction to this project. The report of the latter project has not been made public

¹ https://www.jp-demographic.eu/wp-content/uploads/2017/06/AAL-COST-MYB_Joint_Workshop_Report.pdf

but can be requested from the office of JPI MYBL. Parts of it have been published in German and are free to access (Meißner, 2019).

However, the subject matter is not trivial, and many considerations have been made, articles have been written on several aspects and various forms of research has been carried out. All this and more shall not be repeated at this point. Only some particularly relevant aspects will be addressed.

Confusion of terms

A confusion of terms can be observed which makes it difficult to discuss, research into, compare and evaluate technical systems and to effectively extend this field. Depending on the author and cause, denominations and classifications differ. Kunze and König (2017) present the example of the collective term “Ambient Assisted Living” or “Active Assisted Living”. AAL encompasses both technical systems and research work in a wide range of areas in which technical care and support enable people in need of help in everyday life to achieve a better quality of life. So far, no uniform definition or classification for AAL solutions has been able to establish a common standard. Few attempts have been made to systematize the research field (König & Kunze 2017). Kunze and König try to solve this by dividing technical systems into specific domains and linking each of them to a related discipline and reference models. But even this procedure is not generally accepted and is questioned elsewhere (Petersen & Manzeschke in Press). Another example is the term “eHealth”. The WHO defines eHealth as “the use of information and communication technologies (ICT) for health”². Individual authors use the term to refer to almost all technical applications that are in any way related to health (e.g. Andelfinger & Hänisch, 2016). The European Commission, in turn, defines eHealth similarly to the WHO definition: “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. The descriptions are ambiguous. eHealth focusses on ICT but AAL does not exclude those systems. It is either redundant or not selective. This confusion of terms manifested itself in the workshop discussions. However, such divergences illustrate that finding a common language basis is essential for beneficial enhancements (cf. Petersen & Manzeschke in Press). Language shapes reality. This should not be underestimated.

Both, older people in need of care and formal and informal carers are probably not looking for types of technology (e.g. ICT) or technology categories (e.g. eHealth), but rather for solutions to their problems or care issues. Overall, it seems crucial to differentiate between technologies in care not according to categories, types of technology, functionalities, or technical conditions, but rather according to relevant needs, demands or phenomena. This approach would also lead to the elimination of stigmatizing labels, such as “gerontechnology” or “care technology”, which can lead to technology being rejected (e.g. Astell, McGrath, & Dove, 2020).

² <https://www.who.int/ehealth/about/en/>

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

It is time to stop regarding technology as an outstanding feature from which everything else is derived. According to this point of view there is no alternative to the use of technology. In fact, the use of technology must be based on needs and requirements and whether technology can maintain or support a good later life and related care. It is important to express and describe this in suitable language and terms. Given the rapid progress of technology, the different labels, associations or even magazines⁴ emerging in the field, and the fact that we are losing sight of alternatives, it is necessary to rapidly identify an effective way of addressing this issue.

How to identify needs – and choose the “right” technology

Within ageing and technologies needs are related to managing daily life. Indeed, we start from an individual perspective. At the same time, in terms of ageing and care, general conditions must be considered such as the care framework, financing or access. The specifics of dependence must also be reflected. Against this background, a perspective from a purely individualized view is too short, as the consequences of care typically involve others close to the person in need of care. It should be further noted that needs, abilities and wishes vary between recipients, family & related parties, care-professionals, and service providers. The following table is an extended version of Meißner (2018, p. 5) and pragmatically describes different needs from a meta-level between involved parties within ageing and technologies in care. Conflicts can arise based on these different needs.

Perspectives on need, e.g.				
Older people	Informal caregivers	Formal caregivers	Service providers	Tech companies
<ul style="list-style-type: none"> ▪ Fair & affordable access to help & care ▪ Information about opportunities for help & financing ▪ Someone to organize 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 	<ul style="list-style-type: none"> ▪ Fair & affordable access to help & care ▪ Information about opportunities for help & financing ▪ Organize 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 	<ul style="list-style-type: none"> ▪ Organize care needs within organizational 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 	<ul style="list-style-type: none"> ▪ Optimize processes ▪ Minimize risks ▪ Improve quality ▪ Improve working conditions ▪ Generate a return 	<ul style="list-style-type: none"> ▪ Generate turnover and profit ▪ Planning security ▪ Security of investment

Table 1: Perspective on need – pragmatically described from a meta level (following Meißner 2018, p. 5)

⁴ e.g. <https://journal.gerontechnology.org/>

In all cases, knowledge of technical systems and their possible applications, potentials and limitations, costs and availability as well as potential consequences are an essential prerequisite for decision-making and acting.

However, it is not easy to gain and maintain an adequate overview. Helpful technology can come from different areas. While “aids” in the stricter sense are typically sold by the specialized medical industry, systems for adjusting the living environment (e.g. active lighting control) can be sold in do-it-yourself (DIY) stores, while communication aids (e.g. mobile devices) can be available in electronics stores. Helpful apps are also usually only distributed via the Apple and Google app stores. The active search for technical solutions for a specific care issue can therefore be difficult and time-consuming (Kunze & König, in Press).

In addition, potential users and their dependants need to be empowered to decide if, when and which technology is the best for their needs. On one hand, this requires health literacy combined with digital literacy. On the other hand, care professionals need competencies, e.g. to inform recipients about technology, to educate the care recipients and informal caregivers about technology and to arrange effective counselling and discussion to empower beneficial decision-making and to provide care by means of technology (cf. Meißner, 2018). In the institutional care context, the caregiver draws 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 empower concerned parties in that regard. Referring to the former fast-track process (2018) it should be considered whether technology can be used to deliver education in that regard, e.g. Massive Open Online Courses (MOOCs) (cf. Meißner, 2018).

Furthermore, regarding dependencies and conflicting interests in care the questions must be clarified of who identifies the need for a technical system and determines whether there is an alternative on a human basis and, if necessary, who ultimately decides for or against technology and on the usage of the product. Since costs have to be calculated for technical systems, in the future it will also be a question of financing and thus of equality.

In view of the question what technology in fact can meet which need a number of aspects merit emphasis: Firstly, given the fact that interactive work always has two levels (task-driven: the “what” of the action *and* emotion-driven: the “how” of the action) and that these levels are inseparable and always occur simultaneously, these characteristics must always be considered. Incidentally, the question long discussed in the scientific context of the value of human caring has also found its way into the daily press. The New York Times⁵, for example, stated in spring 2019 that human contact may be a luxury good in the future and has triggered a worldwide discussion about that issue. Interesting here is, that this discussion takes up the emotion-driven aspect, but without specifying it explicitly as only one part of a care activity. To conclude, **the characteristics of interactive work must be given more emphasis within**. Secondly, it should be noted that **the benefits of technical systems to fulfil needs cannot be**

⁵ <https://www.nytimes.com/2019/03/23/sunday-review/human-contact-luxury-screens.html>

considered in general terms. Rather, it must be recognized that an assisting function can only be defined in relation to a specific user group and a definite reference framework (Krings & Weinberger, 2017). In fact, completely different questions arise e.g. in regard to robotics than in regard to digital platforms.

Between hype and innovation

Technical innovations are generally considered to have a high potential for change in all areas of society, including care. Often these innovations tend to be incremental, i.e. they occur in small steps. However, digital technologies in particular can also lead to very rapid and radical changes that completely question or replace previous structures and processes that may have been established for a long time. These are then referred to as disruptive innovations⁶. A new technical possibility does not in itself constitute an innovation. The key issue is that it is transformed into new products or services that meet a concrete need and for which there is a market. In innovation management, one also speaks of an interplay between push factors (technical possibilities as triggers for innovations) and pull factors (application needs as triggers). Sometimes one side, sometimes the other plays a more essential role in innovations (Kunze in Press). And even if technology cannot always be clearly categorized in one category or the other, as the examples in the national reports show, modern technological possibilities are of great importance for social innovations. As a result, it is becoming increasingly important for carers to identify and evaluate existing and future technical changes and to assess their impact on changes in care. However, this is not so easy: experience shows that technical changes are often misjudged. Underestimating the effects of disruptive innovations is just as problematic as overestimating the possibilities of new technologies (Kunze in Press). This misjudgement leads to difficulties, e.g. implementing immature technology rapidly and at scale, where non-adoption is predictable and positive social changes cannot be expected.

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 (Greenhalgh & Abimbola, 2019). However, new technologies are often associated with exaggerated expectations. There are many reasons for this. Firstly e.g., new things are fascinating for many (“shiny object syndrome”), while hopes for disruptive positive changes are more likely to appeal to us and are more widely disseminated than other messages. And secondly, promising positive disruptive changes attracts us more strongly and become widespread than neutral description of disruptive technologies. Rather, factual information on disruptive technologies does not tend to carry positive feelings. Companies that develop new technologies often benefit from the fact that the possibilities of their products are overestimated. Optimistic assessments promote the adoption of the technologies by pilot customers and facilitate the raising of investment capital. Such misjudgements are therefore economically useful for companies, which accordingly have no interest in counteracting them.

⁶ A commonly cited example of disruptive change is the downfall of the Kodak company. In the 1990s, Kodak employed more than 100,000 people, mainly in the production of films and photographic paper. As a result of the rapid expansion of digital photography, Kodak had to file for bankruptcy in 2012. In the same year, the start-up Instagram, which at that time had just 12 employees and was developing its social network for sharing digital photos and videos, was sold to Facebook for \$1 billion (Kunze in Press).

At the same time, information on new technologies is often difficult to verify, as the information required to do so is often protected as business secrets and thus not available. 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 (Kunze in Press). One example of missing objective data is the number of users mentioned in the national reports on various technologies. They are mostly based on statements by the producing company.

In summary, **it is important to enable innovation. At the same time, it is advisable not to follow all hype, and to be realistic.** Weighing innovation against hype is not a trivial matter. This report may help to set priorities.

Complexity of the change process

Implementing technology in the field of ageing and care is inherently challenging. Research has shown that much is known about e.g. technology adoption, accessibility, impact, care needs, processes, and participation necessities (c.f. joint workshops on ageing and technology 2017, 2018). Still many technological products have not been adopted, are abandoned by individuals, or failed to scale up locally or have not been implemented long term at the organizational level (Greenhalgh et al. 2017). There has been identified a variety of factors that hinder or promote technology adoption, accompanied by socio-technically informed theories of individual, organizational, and systemic change. Still it is becoming increasingly evident that technology in care is more than just one added aspect that needs to be managed technically. Rather reality shows to achieve social change dealing with multiple complexities is highly significant as for example:

- Technology readiness (maturity) level of the technology
- Knowledge mobilization
- Acceptance of the participants
- Participant involvement in R&I
- Integration into existing care processes
- Regulation framework
- (Re-)financing (following Kunze, in Press)

Our knowledge is still limited and in recognition of technologies a better understanding of the impacts of disruptions to sociotechnical interrelations is mandatory. The more factors we get to know and consider, the more likely is that the implementation will be successful and lasting. According to today's knowledge, the NASSS Framework might be an option to identify and manage this complexity.

4

Experiences, opinions, and stakeholder viewpoints

At the third workshop an interdisciplinary group of sixteen stakeholder representatives nominated by JPI members from nine European countries discussed “good later life”, “good care” and technology’s contribution to that. Since the third workshop focuses on the stakeholder’s perspective in order to take their most important unmet needs into account, experiences, opinions and stakeholders’ viewpoints were obtained. Various methods and tools were used for this purpose, which enabled strongly interactive and collaborative work and a related discussion. The first vision drafted by the experts was initially not made available to the stakeholders. During discussion, it became apparent that the key points agreed between national experts and stakeholders on technology in care within later life should be in conformity with internationally agreed human rights standards.

In recent years, there has been a debate as to how well the rights of older persons are protected. Although there are a range of international agreements which are relevant, the circumstances of older people in need of care are rarely explicitly covered either EU-wide or internationally (ENNHRI 2017, p. 29). This deficit creates challenges to the field of ageing and technology. However, international law relevant to the rights of older people are the common denominator, binding all countries equally. This provides the overarching framework for the protection and promotion of older people’s human rights, laying out the standards and the approach, which domestic law then implements.

To pay more attention to human rights standards within ageing and technologies, overall categories of human rights standards for older people were pragmatically identified in preparation for the workshop (following ENNHRI, 2017). Sixteen categories appeared, e.g. equal access to care services, choice of care services, choice and autonomy, dignity, participation and social inclusion or palliative and end-of-life care. To depart from this abstract level, the third workshop discussed the meaning of different kinds of technology in ageing and care in the context of human rights standards.

Due to the heterogeneous group and the limited time available, a pragmatic approach was chosen. In addition to a general discussion on “good care” and “good later life” as well as general, well-known prerequisites that are necessary for technology to contribute to a good life at all (e.g. knowledge, user-centred design, participation, easy language and operation), the discussion was primarily focused on two aspects, namely

1. What is the role – positive or negative – of technology in securing human rights?
2. How important is technology in securing these rights?

Examples were given and discussed. As expected, views differ. However, the range of variation was interesting, both between different human rights and within a single right. It was found that the range of variation within some rights was lower than in others. It was also found that there are major differences between rights, e.g. between the right of participation and social inclusion and the right to palliative and end-of-life care. For example, regarding the right to participation and social inclusion, digital communication tools were primarily discussed. They were mainly seen to considerably support human communication and contacts. In direct contrast, regarding the right to palliative care, staying in contact with loved ones who live far away also played a role, but the focus was on bodily and affective needs. For this reason, technology was considered to have the least contribution and significance in this

field. This may indicate that some human rights standards are better protected by some technical systems than others and is worth further investigation.

All in all, more attention should be paid to human-rights-based care. **Human rights and human rights principles must be used as a yardstick for good care.** Within that principles new and emerging technologies must then be interpreted and evaluated.

5

National reports

The complexity of ageing and technologies in care as part of a good later life should now be obvious.

Agreed template and structuring questions

Part A gives a brief introduction to the country

In addition to a brief introduction to the country, this section opens with information about care structures and challenges. The aim of this part is mainly to describe the framework of policy and delivery systems for good care in the country, and the country's general way of dealing with technologies in ageing and care.

Part B provides illustrative examples of the countries' technologies relating to specific issues

The aim of Part B is to provide some examples of technologies that are being developed, provided, used, or discontinued for various reasons in each country. This includes technologies addressed at 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). It must be stressed that the description of the technical systems in this report is only a snapshot of illustrative examples. The national authors do not warrant or indicate that

- the list of care technologies is exhaustive or error free
- the technologies which are included are of special quality or eligible for support
- the use of the technologies listed is in accordance with the national laws and regulations of any country, including patent laws.

Thirteen categories were identified that make up or have an impact on a “good later life” bearing in mind the critical role of care as people age, and which the chosen technologies might address. Within each category, up to three technology systems are described within structuring questions to be addressed, such as “what technology is it” or “what is the status” (pilot-production, market-ready, on the market). Neither the structuring questions nor the categories are based on any theoretical foundation. They have been compiled from the perspective of the participants. The categories are not selective and do not attempt to be exhaustive but address relevant issues in later life. The agreed categories are

1. social interaction
2. mobility
3. personal hygiene
4. nutrition management
5. cognitive and communication skills
6. behavioural and psychological issues
7. personal safety and security
8. high-needs care for high dependence
9. life and care planning in the context of uncertainty
10. digital literacy
11. accessing care
12. carer skills

13. technologies to give voice to recipients of care
14. further examples.

It should be noted that a “good” later life is not fundamentally different from a “good” life in other phases of life. Nevertheless, as is known, needs change on the one hand and restrictions expand on the other. Focusing on the person in need of care, the participants have formulated relevant aspects from a need-driven perspective. They deliberately avoided classifications which are relevant from a scientific point of view, but which are not known by the laypeople and play no role in daily life. It should be noted that some aspects are not considered separately, such as getting dressed or undressed, or coping and dealing independently with illness and treatment-related demands and stresses. Moreover, personal hygiene, nutrition management and dressing/undressing could, for example, have been summarized from a theoretical point of view as self-care. However, the intention was not to think in terms of theoretical systems of ordering, but to focus on a needs-driven perspective.

Part C summarizes and appraises the results

This section especially summarizes how the countries’ technologies support the countries’ care framework. Altogether, the overall aim of this section was to assess if and how Part B was in accordance with Part A.

The overall summaries on similarities and differences between countries can be found in chapter 6.

5.1 National report: Finland

Matti Mäkelä & Katja Pulli

5.1.1 A brief introduction to the country

Care for the aged in Finland, as well as other social welfare and healthcare, is arranged by the 310 municipalities, and largely financed by local taxes, although of costs are 17% paid directly (Matveinen, 2020). All residents are eligible. Financing is supplemented by state subsidies, which even out differences in the municipalities' population-based needs and their capacity to provide for these needs. Privately funded, partly insurance-based services are supplementary. The private provision of care is widespread, mostly procured by municipalities. In the case of technology, the lines dividing the responsibilities of municipality, service provider, citizen and in some cases, insurance funding, are to some extent blurred. Healthcare and social welfare are poorly integrated. In principle, the same municipalities are responsible for social welfare services (including care for the aged), primary healthcare, and specialist healthcare. This has not been fully implemented at the operational level, and the pathway taken to solve a person's care need often depends on whether their need is identified as relating to social welfare, healthcare, or rehabilitation. Specialized healthcare organizations are mostly owned by associations of municipalities but have a strong independent role in technological care solutions. A key element of care integration is that electronic health records are in use everywhere, and can generally be used by any producer, via the interoperability platform Kanta⁷. The same interoperability platform is being launched for client records in social welfare. For the service user, a key feature of the Kanta platform is that the actual electronic health record is almost always directly visible to the client as well.

Major strategies to ensure quality of care

Finland passed legislation in 2012, to regulate both the promotion of health and good function in old age, and good services for older people (Anonymous, 2012). In addition, Finland has national guidelines produced by the Ministry of Social Affairs and Health and the Association of Municipalities (Anonymous, 2017). Municipalities are required to monitor the quality of the services produced for their residents, whether they are publicly procured or privately funded. Oversight of all social services and healthcare is the responsibility of Valvira, the National Supervisory Authority for Welfare and Health. The oversight of healthcare devices and other technology is the responsibility of Fimea, the Finnish Medicines Agency. In 2019, several instances of serious shortcomings in the quality of care for the aged were publicized in Finland, and strong political pressure ensued to strengthen the norms. The legislation from 2012 was renewed in 2020, and a new edition of the quality guideline is also due to be published in 2020.

⁷ What are the Kanta Services?

Finland's approach to technologies in care

The Finnish government recognizes the importance of technologies for the future of healthcare and other care for the aged. A concerted programme for the development of robotics and artificial intelligence, the Hyteairo programme⁸, has brought together healthcare providers, municipalities, researchers, technology developers, user organizations and industry partners to develop pathways for incorporating new technologies in all aspects of care. One focus has been technology to support older people living at home (Lähteenmäki et al., 2020). Healthcare-related technology is often regarded as a component of the integrated plan for care or rehabilitation, and therefore funded by the municipality. This is not always consistent, and some technologies are general commodities to be privately purchased by the persons themselves, or otherwise not part of well-established healthcare or social welfare. The principles for this split are not clearly defined. Innovative technologies are often marketed to municipalities as potentially cost-saving, in the hope of gaining easier access to the market than by consumer competition. One important component of the strategy for technologies in care for the aged is relatively good technological literacy in the general population, including among older people (Heponiemi et al., 2020).

5.1.2 Contribution of technologies to care on specific issues

Contribution of technologies during the COVID-19 pandemic

Most technologies promoted for uses related to the COVID-19 pandemic are targeted at the general population, not to older people at a higher risk of serious illness. Even so, such general-use technologies do also help older people. In Finland, a corona virus symptom checker was quickly added to a public service portal for assessing symptoms and offering guidance to services, the Omaolo Service⁹ ("Am I OK"). It encourages users to log-in, which enables healthcare professionals to intervene rapidly and find cases, in addition to offering localized service guidance. In June 2020, the Finnish Parliament approved the rapid development and implementation of a voluntary contact-tracing app, based on Bluetooth technology. The app was made available in app stores on Aug 31, 2020¹⁰. The lockdown and quarantine procedures in place during the COVID-19 pandemic have resulted in a disproportionate seclusion of older people, especially those with severe comorbidities. Many municipalities and non-governmental organisations have developed local practices to support the activities and participation of older people. Many of these practices have been described and shared in the InnoVillage forum¹¹, a platform developed to support the adoption of many kinds of best practices, not only technology.

⁸ The Well-being and Health Sector's Artificial Intelligence and Robotics Programme (Hyteairo)

⁹ Omaolo Service

¹⁰ An application that helps break the chains of infection Koronavilkku

¹¹ InnoVillage practices to support older people's functioning during the corona pandemic

Contribution of technologies to social isolation and loneliness

Apart from standard technologies for consumers, healthcare, rehabilitation and social welfare, no especially interesting technologies were identified in the Hyteairo programme or during this review.

Contribution of technologies to mobility

One important aspect of mobility support is the design of buildings, public spaces, services, and public transport. The mainstreaming of accessibility and Design for All principles can be seen in the standardization of building requirements (elevators, washrooms, doorways, lighting). This has a direct impact on older people's mobility.

Contribution of technologies to personal hygiene

VIUDETTA

Viudetta¹² is an after market electronic washer & dryer bidet that is compatible with the smaller Nordic toilet seats. In situation, when a person's functional capability is compromised Viudetta facilitates independent toilet visits, while maintaining their privacy and dignity in personal hygiene. Viudetta is an ecological choice, saves nature and has low running costs. The product is in use in almost every municipality in Finland.

Contribution of technologies to nutrition management

MENUMAT

One promising technology is a meal service device with a freezer and small convection oven (MenuMAT)¹³. The device tells the user in speech which meal they need to eat and what the device is currently doing. The service instructs users how to heat up the chosen meal, prepares the meal in around half an hour and announces when the meal is ready to be eaten. If needed, a timer function can be used. The automated meal system stores 18 meals, so the meals can be delivered every 18 days if needed. The food selection is planned according to nutritional recommendations and the menu includes over 70 main courses, desserts and a selection of ice creams and snacks. The system sends user information to the service provider. This information can be used when the time comes to order more meals. The service also includes the delivery of other goods without a separate delivery fee. This meal service is used in the municipalities as a supplementary meal service, but it is also sold directly to the private sector. The cost of the service is based only on the price per meal, which is €7-€11 per meal for the private sector. The service currently has 1,500 users, a third of whom are in Helsinki.

¹² <https://www.viudetta.fi/>

¹³ <https://www.menumat.fi/>; English summary

Contribution of technologies to cognitive and communication skills

PEILI VISION

The Peili Vision (mirror vision) solution helps with neurological rehabilitation¹⁴. The service includes a platform that combines three practices: VR technology, data, and gamification. The mission is to empower every rehabilitee to exercise in the most effective way possible, whether they are in a hospital or at home, and with the best exercises designed by professionals. The application allows the therapist to create unique training environments customized to the rehabilitee's requirements. It is designed to be used in several therapy fields, including speech therapy and neuropsychology. It can be used by rehabilitees of all ages. The training is done in real life surroundings in virtual reality. While the rehabilitee is training in the virtual world, the therapist can measure their progress, and offer improvements in real time from any distance. This product brings rehabilitation to rehabilitee's home. It provides a means for the therapists to remotely control and adjust the progress of the training. Home rehabilitation also enables more repetitions and practice, which means more actual rehabilitation.

Contribution of technologies to behavioural and psychological issues

TERVEYSKYLÄ

The use of digital services, including chat bots, is part of the online suite of health and rehabilitation support services in the Terveyskylä ("Health Village")¹⁵ portal. Besides general information, the mental health section also includes a guide to services, symptom navigation, and web-based support for actual therapies and self-help support for various mental health concerns.

Contribution of technologies to personal safety and security

An older person contemplating future life at home in the face of increasing dependence and a potential need for care needs may feel confident about coping at the moment, but still concerned about what might happen in the future. Being made to feel safe and secure, even in the event of a new or worsening disease, or changes in the environment, is crucial to people's trust in society and the ability to continue living at home. That feeling should not be an illusion, but on the other hand, anxiety about their unknown future should not create an imagined need for superfluous measures such as premature residential care.

SMART FLOWER STAND SYSTEM

The Smart Flower Stand system is an intelligent technology solution that does not require any action from the user to get help¹⁶. The solution uses AI, motion sensor data and several other sensors, combining the data to provide sufficiently accurate information about the resident and how he or she copes with everyday tasks at home. The solution has been used in more than 6.000 homes and has been involved in the development of Functional Home Care in the flagship project run by the Ministry of Social Affairs and Health. There are 18 international patents for the solution. Technology is involved in

¹⁴ <https://peilivision.fi/>

¹⁵ <https://www.terveyskyla.fi/>

¹⁶ <https://seniortek.fi/en/ratkaisu/smart-flower-stand/>

several international projects, e.g. EIPAHA, where technology looks for variables to predict falls. This technology can be applied to seniors enabling them to live in their homes for several more months) and special groups, whether they live at home, in a care home, in an old folks' home or in a hospital. Attitudes towards it are positive because the resident is not obliged to wear a sensor or a wristband and there is no need for maintenance. Its unobtrusiveness means that the technology brings a sense of security to the resident, the employees of the service organization and relatives. The added value of this technology is very much the sense of security that if something happens, help will come automatically and the request for help will be addressed to precisely the right person without delay (the request goes to the helper and not to the control room). This technology promotes equality in all respects because the cost to the user is low and it is easy to use. The solution pays special attention to individuals' dignity and privacy, as it does not collect data that would violate the customer's privacy or otherwise identify them (no cameras or microphones). The technology can be used at home from very small apartments to large detached houses. If necessary, the same technology can be transferred with the resident to e.g. senior homes or assisted living facilities. The strength of the technology is its flexibility and scalability. All changes in its operation can be made remotely without disturbing the occupant. The device was developed based on the customer's needs and has been designed to support different types of service organizations. One weakness could be its unsuitability for current care processes. Technology and care processes should be more strongly integrated, which would bring real benefits to both society and residents. For the resident, the benefits are reflected in quality of life, a longer time spent living at home and a sense of great security. The benefits for service organizations are reflected in a more precise allocation of resources and thus time for actual care work, which is also reflected in an improvement in the residents' quality of life.

NAVIGIL

The Finnish telecare solution Navigil helps older adults to live independently and confidently in their own homes¹⁷. The Navigil service alerts a member of the caregiver team if there is an emergency or if a change in their overall wellness trend has been identified. For dementia sufferers, the solution features easily defined and edited safe zones on the map, and an automatic alert and location information when they leave their home and exit the safe zone. GPS location and activity monitoring features enable them to call for help with a single push of a button. An automatic alert is also sent out in case of a fall or immobility due to loss of consciousness.

Contribution of technologies to high-need care for high dependence

Apart from standard technologies for consumer use, healthcare, rehabilitation, and social welfare, no especially interesting technologies were identified in the Hyteairo programme or during this review.

Contribution of technologies to life and care planning in the context of uncertainty

Apart from standard technologies for consumers, healthcare, rehabilitation and social welfare, no especially interesting technologies were identified in the Hyteairo programme or during this review.

¹⁷ <https://www.navigil.com/>

Contribution of technologies to accessing care of any type

In Finland, telemedicine has been an integral part of many specialist healthcare services. One of the first examples was a telestroke service (Hubert et al., 2016), but many other specialties, including geriatrics, are provided to health centres in remote parts of Finland using telemedical technologies. Most of these services support general practice, nursing, or first response professionals.

SANOSTE

One important emerging technology is a rehabilitation service at home, using interactive videolink services. One instance of this technology especially for older people is provided by Sanoste¹⁸, which has recognized the role played by older people and their informal carers (and not only healthcare organizations) as potential buyers. Sanoste provides stimulating activities for homebound seniors. They are guided through activities such as chair exercises or balance workouts in real time, with the service providers present to motivate the users and create a safe environment for them. The services are delivered to a tablet device or laptop using real-time video chat. This enables two-way communication, creating real, intensive interaction between the service provider and the user. Although the service providers are instructing several participants simultaneously, the individual client feels like they are participating in a personalized private lesson. They do not see the technology but instead feel as if the instructor is in their living room, and are hence motivated to do the activities. Sanoste's two-way digital platform connecting the service providers and users create a completely new way to deliver services that are inexpensive, automated and fully scalable. The activities are purchased at an online store and are already on the market. The activities are mainly purchased by nursing homes, municipalities, seniors living at home or relatives worried about their loved ones. Sanoste is presently operating in the domestic market but planning to start exporting. The Sanoste solution has been developed together with older users to ensure its ease of use. Based on the end-of-session user survey, 97% of the customers are satisfied with the services.

VIDEOVISIT

VideoVisit[®] is a complete remote care platform that offers tools for providers of social services and healthcare¹⁹. VideoVisit[®] provides solutions that help people live independently at home for as long as possible. VideoVisit[®] provides a digital outpatient care platform. Clients living at home receive a tablet, which provides constant 24/7 monitoring. It supports caregivers by replacing less intensive home care visits, where physical contact is not required, with remote visits. The service includes scheduled online doctor's appointments, online text and video chat, a chat bot, secured doctor-to-patient communication, online doctor's consultations, virtual care, telerehabilitation, remote diagnostics and remote patient monitoring. The tablet also enables communication with family members. The service is 85% more cost-efficient than physical home care; healthcare providers can treat 10 times more patients per work shift. VideoVisit[®] is a market leader in Finland, with an over 85% market share. Over 100 municipalities and

¹⁸ <https://sanoste.fi/sanoste-in-english>

¹⁹ <https://www.videovisitglobal.com/>

hospital districts use the service. The VideoVisit® platform has made over one million virtual care visits and saved more than €400 million for Finnish healthcare service providers.

EVONDOS

Safe, correct and reliable medicine dispensing is a service needed by most home care or residential care clients, and it has great potential for robotization. The Evondos service is based on advanced technology and consists of an automatic medicine dispensing robot installed in private homes, with a cloud-based control system for handling medicine sachets and service elements²⁰. The control system prevents sachet reading errors as it allows any of the multidose sachets in the Nordic market to be controlled remotely, ensuring that the correct medication is taken over 99% of the time.

NUKUTE and HEART2SAVE

Nukute²¹ and Heart2Save²² are two technologies intended to lower the barriers to diagnosing critical problems, specifically sleep apnea and atrial fibrillation. These are wearable or semi-wearable sensor technologies, supplemented with artificial intelligence to interpret the sensor data, but in both cases, the key innovative element is that the good design of both the physical device and the user interface removes a significant deterrent to the use of the technology.

Contribution of technologies to carer skills

CAUSALUS

Causalus, a medication review and decision support service with artificial intelligence elements, is based on the ideology of deprescribing²³ – reducing the adverse drug effects so common among the frail older people. The service includes a framework of a medication review, symptom follow-up before and after deprescribing, and online consultations between the physician, pharmacist, and nurse.

Digital literacy

SUOMI.FI

Several providers have developed services to assist older people and others with limited experience of using digital technologies. One hub for such services is the generic public information and service portal Suomi.fi²⁴, part of which is focused on digital support. Service providers can provide guidance and help with the use of a computer, mobile phone, tablet computer or other mobile device. Guidance on and help with using electronic services is also provided. The support can include courses on the use of devices or services, guidance events or one-on-one help. The authorities offer help on how to use their own web services. Many digital support providers, such as libraries and associations, provide guidance on the use of both the authorities' services and other web services. Authorisation is required for another person to use the web services on your behalf. Local authorities have also created digital assistance services. For

²⁰ <https://www.evondos.fi/>

²¹ <https://nukute.com/>

²² <https://heart2save.com/>

²³ <https://www.causalus.com/services>

²⁴ <https://www.suomi.fi/frontpage>

instance, the City of Helsinki digital assistance service provides support and guidance on using computers, tablets and smart phones as well as with problems linked to using different kinds of e-services, online services and most common applications. After submitting a request for remote assistance, the person offering remote digital support contacts the client by telephone to agree on the support needed in more detail.

Contribution of technologies to give voice to recipients of care

Apart from standard technologies for consumers, healthcare, rehabilitation, and social welfare, no especially interesting technologies were identified in the Hyteairo programme or during this review.

5.1.3 Summary

Within the KATI project, interviews were carried out with the regional authorities in charge of care for the aged, asking about their needs and interest in agotech at home, in residential care, or primary healthcare and social work, and what are they already using. The selection of technologies already in use or piloting was quite homogeneous. Wearable alert technologies, e.g. with sensors or GPS, were in use in most regions. Telecare for home care and rehabilitation, with video linkage to the client, was also in use, as were medicine-dispensing robots and the MenuMAT meal centre. Future perceived needs and hopes for technologies involved physical robotics, social interaction robots, adaptive environments and conversational artificial intelligence as part of healthcare and social welfare. Professionals also expect to see the integration of patient-derived data directly supporting healthcare and social welfare. Even with a concerted national programme such as Hyteairo, the uptake of new technologies is highly dependent on directly financed development projects, which tend not to be sustainable on the market on completion. Even promising technologies have a high risk of being lost to bankruptcy after the initial development phase. The most resilient technologies are those which, at an early stage in their development, identify sufficient numbers of clients who are willing to pay for the service. Paying customers of this kind are not necessarily end users, as many care technologies are appropriately funded by care organizations, and many enabling technologies embedded in our living environment are silently funded by the general population.

5.1.4 References

Anonymous (2012). Act on Supporting the Functional Capacity of the Older Population and on Social and Health Services for Older Persons. (No. 980/2012). Parliament of Finland.

<https://www.finlex.fi/en/laki/kaannokset/2012/en20120980?search%5Btype%5D=pika&search%5Bkieli%5D%5B0%5D=en&search%5Bpika%5D=980%2F2012>

Anonymous (2017). Laatusuositus hyvän ikääntymisen turvaamiseksi ja palvelujen parantamiseksi 2017–2019. Sosiaali- ja terveystieteiden ministeriö. <https://julkaisut.valtioneuvosto.fi/handle/10024/80132>

Heponiemi, T., Jormanainen, V., Leemann, L., Manderbacka, K., Aalto, A., & Hyppönen, H. (2020). Digital Divide in Perceived Benefits of Online Health Care and Social Welfare Services: National Cross-Sectional Survey Study. *J Med Internet Res*, 22(7), e17616.

<https://www.jmir.org/2020/7/e17616/pdf>

- Hubert, G. J., Meretoja, A., Audebert, H. J., Tatlisumak, T., Zeman, F., Boy, S., Haberl, R. L., Kaste, M., & Müller-Barna, P. (2016). Stroke Thrombolysis in a Centralized and a Decentralized System (Helsinki and Telemedical Project for Integrative Stroke Care Network). *Stroke*, 47(12), 2999-3004.
<https://www.ahajournals.org/doi/epub/10.1161/STROKEAHA.116.014258>
- Lähteenmäki, J., Niemelä, M., Hammar, T., Alastalo, H., Noro, A., Pylsy, A., Arajärvi, M., Forsius, P., Pulli, K., & Anttila, H. (2020). Kotona asumista tukeva teknologia - kansallinen toimintamalli ja tietojärjestelmät (KATI-malli). VTT Technical Research Centre of Finland.
<https://www.julkari.fi/handle/10024/139753>
- Matveinen, P. (2020). Terveysthuollon menot ja rahoitus 2018: Terveysthuollon menot jatkoivat kasvuaan (Health Expenditure and Financing 2018). (No. 23/2020). Helsinki, Finland: Finnish Institute for Health and Welfare.
https://www.julkari.fi/bitstream/handle/10024/140191/Tr_23_2020_korjattu.pdf?sequence=5&isAllowed=y

5.2 National report: France

Fabrice Gzil

5.2.1 A brief introduction to the country

Like many countries, France is experiencing a demographic transition. Whereas life expectancy at birth was only 47 years in 1910, it is now 83 years. In 2030, people aged 60 will still have an average life expectancy of 25 to 30 years, and people aged 80 will still have an average life expectancy of 9 years. This longer lifespan is having an impact on the number and proportion of older people in the population. France currently has 67 million inhabitants. The figure is expected to reach 70 million in 2030 and 72 million in 2040 (+ 7.7%). The over-65s, who number 13 million today, will reach 16 million in 2030 and 19 million in 2040 (+ 45%). Meanwhile, the over-80s number 4 million today, and will reach 5 million in 2030 and 7 million in 2040 (+ 72%). In terms of the proportion of seniors in the population, the over-65s today represent 20% of the population. In 2030, they will outnumber those under 20 for the first time (Guedj et al., 2018). However, in France, life expectancy without disability remains between 60 and 65 years, which means that advancing age is often accompanied by health problems or disabilities. Most older people are not affected by what is called “dependence” (the existence for people over 60 of a need for help in carrying out the basic activities of daily life). Only 8% of the over-60s and only 17% of people aged 80+ benefit from the APA personal autonomy allowance. And of the 7 million older people registered as having a functional limitation, only 1.3 million need help in carrying out the basic activities of daily life. However, the number of older people with high care needs is expected to increase sharply in the coming decades: 1.6 million in 2030, 1.9 million in 2040, 2.2 million in 2050, 2.4 million in 2060 (Guedj et al., 2018). Today in France, there are approximately 1.1 million people living with a major neurocognitive disorder (such as Alzheimer’s disease): 4% of septuagenarians, 20% of octogenarians and 40% of nonagenarians. There could be 2 million in 2030 (Gzil, 2018). Around 600,000 people live in 7,500 nursing homes and 100,000 in assisted living facilities (“résidences autonomie”). In other words, the majority of older people live at home, even those experiencing functional disabilities. For instance, 60% of older people receiving the autonomy allowance live at home. 3.9 million people provide regular help to an older relative at home. An increasing number of older people are living alone, remote from family support (CNSA, 2019).

Major strategies to ensure quality of care

It is difficult to say how the country as a whole understands the notion of a good later life. As in other countries, in France there are competing visions of what a good later life is, should, or could be. There seems to be an enduring stereotype shared by a number of citizens that a good later life is a contradiction in terms; that age and ageing cannot be positive or successful, since (in this negative vision) ageing is equated with illness, the loss of functional autonomy, dementia, loneliness, etc. However, there also

seems to be a relative consensus about what aspects should not be present in order to have a good later life, and a number of clues indicating what a general understanding of a good later life might be. Negatively, there seems to be a general consensus about the idea that later life should especially not mean social isolation, discrimination, ageism, stigmatisation, abuse or neglect. Positively, it seems to be thought that people enjoying a good later life

- stay healthy, without functional incapacities, as long as possible, and can have access to adequate healthcare and social care services, if needed,
- have opportunities to meet their friends, families and loved ones,
- are protected from abuse and neglect,
- feel safe and in control of their lives,
- can live at home as long as possible, and feel at home, whatever the setting,
- can contribute to society and engage in enjoyable and meaningful activities,
- can participate in life and in the decisions of the community,
- are treated with respect and feel considered,
- have equal and effective access to mobility, culture, nature, leisure, learning, etc.

Regarding the vision of what is “good care in later life”, an important reform of elder care has been under discussion in France for many years now, meaning that a large number of commentators have tried to describe what care for older people should be like. Some of those contributions describe the present situation of elder care as exemplifying what good care in later life should not be like. In a nutshell, the general idea is that there have been major improvements in the standards of care compared with the situation before 2000, especially in terms of nursing homes, care professionals’ qualifications, and recognising the rights of older people. However, it is considered that the current paradigm of elder care:

- is focused on loss of physical and cognitive function,
- arrives too late, when health problems and disabilities are already serious,
- is strongly divided between healthcare and social care, and mainly medically oriented,
- suffers from insufficient nurse-patient ratios, a poor job image, insufficient qualification and remuneration of care professionals, and insufficient support for family carers.

Taking into account the law intended to adapt society to ageing (voted in 2015), the work of the national agency responsible for elder care and disability care (CNSA, 2018, 2019), and recent reports (Libault, 2019; El-Khomri, 2019; Dufeu-Schubert, 2019), there is a general consensus that, in the future, elder care should

- build on strengths and recognize the diversity and individuality of older people,
- focus on the individual and collective prevention of age-related health conditions (detect frailty, prevent falls, malnutrition and the onset of cognitive disabilities) and on rehabilitation and making up for physical and cognitive disabilities,
- resist the idea that older people who need care have to live in nursing homes: they should be able to stay longer in their own homes, there should be a greater variety of accommodation

solutions, nursing homes should be more integrated into the community, and residents should feel at home in these institutions,

- fight social isolation and create the conditions for older people to exercise their citizenship, to be included in society, and to participate in their care decisions and in the choices of society.

For instance, in 2018, the National Ethics Council (CCNE, 2018) wrote “It is clear that the institutionalization of dependent older people and their concentration in one place sometimes generate undignified situations (...). The de facto exclusion from society of which these people are victims probably relates to a collective denial of what old age, the end of life and death can be like (...). Although this forced institutionalization is touted as being in the name of principles of benevolence and ensuring people’s safety, it is often done under duress, for lack of any alternative, and people are forced to pay for accommodation that they did not want.”

The Ethics Forum of the Paris Region (Espace éthique d’Île-de-France, 2016, 2017) insisted that: “In community care for older people, respect for the person, their privacy, their uniqueness, their preferences and their choices is crucial. There is a requirement for consistency, competence and cooperation among care professionals and care institutions. It is important to anticipate crisis situations or necessary decisions. The quality of care and therefore the well-being of the person depends on family carers and relatives being integrated into the care organization.” “In nursing homes, everyone must be recognized unconditionally in terms of the integrity of their personality and of their citizenship, and be able to benefit in all circumstances from care and support adapted to their situation, respectful of their individuality, their needs of all kinds and their autonomy.”

There is also a consensus that ageing is an issue for society as a whole, that infrastructures, housing, cities, etc. should adapt to the ageing population, that a society caring for older people should be more inclusive and welcoming towards them, including older people with cognitive disabilities. Last but not least, if healthcare is publicly funded, the costs of social care are important for older people and their families, especially when people are living in a nursing home. It has been estimated that half of residents in nursing homes have to pay €1,850 a month, all allowances included (Guedj et al., 2018).

To sum up, according to this framework, good care in later life

- is effective, person-centred, available to anyone who needs it,
- respects and promotes the person’s dignity, autonomy, safety and quality of life,
- considers the older person in their environment, as related to their loved ones, and as members of their community and society.

France’s approach to technologies in care

In 2019, the French government published an ambitious roadmap to “accelerate the digital shift in healthcare”. It was highlighted that “Digital technology is not an end in itself. It is a way to better coordinate health professionals, to develop therapeutic and organizational innovations, to fight against the health divide, to reposition the citizen at the heart of the health system, in short to provide better

care.” More specifically regarding older people, along with many stakeholders, the National Ethics Committee (CCNE, 2018) recommended “to make digital technology a tool to promote support for older people and to create new forms of solidarity”. It is widely recognized that technology may (Michel et al., 2018)

- support and empower older people in their living situation, maximizing their functional autonomy and quality of life,
- contribute to the prevention, diagnosis and treatment or rehabilitation of age-related health issues and disabilities,
- encourage relationships between generations, contacts between older people and their loved ones, and social participation and inclusion.

However, technology and digital solutions are not widely used in elder care for the moment (Biancarelli et al., 2019). It is also stressed by many stakeholders that (Brugère & Gzil, 2019)

- the more promising care innovations for older people combine technology with human presence and intervention,
- the goal should never be technology for technology’s sake; its function is to improve people’s quality of life, respecting their dignity,
- technology can take the burden off family and professional carers, but they should above all be at the service of older people themselves,
- technologies should be designed with older people, not for them,
- before developing new, expensive, high-tech solutions, it is important that older people can continue using their existing low-tech or mid-tech solutions, especially when they develop physical or visual disabilities, which are very common among older people,
- many older people avoid solutions aimed at older people, so it is important to develop solutions for everyone which can be adapted to suit older people,
- people who were not born in the digital world can adapt to it, but sometimes feel excluded from it, and some people struggle more with technology (Petits Frères des Pauvres, 2018),
- the issue of affordability is very important to ensure equal access,
- more independent evaluation and transparency is needed regarding the efficacy and efficiency of care technologies.

Last but not least, continuous ethical vigilance and legal analysis are crucial, because certain uses of technology can undermine the dignity of older people (e.g. a clear difference must be made between monitoring for people’s safety and an unwarranted intrusion into their privacy).

5.2.2 Contribution of technologies to care on specific issues

The next sections give a description of 36 technologies. Many more technologies are, of course, used within ageing and care in France, but this election offers an idea of the variety of technologies used and illustrates how technologies can contribute to the different aspects of what can be considered to be

important for a good later life. The selection includes technologies which can be useful for “robust” older people, for “frail” older people and for older people experiencing different forms of disability, or loss of functional autonomy. Their inclusion does not, of course, mean that they are being promoted.

Contribution of technologies during the COVID-19 pandemic

Technologies have played an important role in ageing and care during the COVID-19 pandemic. First, for many people it was the first time they used digital applications for written communication within family groups (e.g. via WhatsApp® groups). Applications for video communication (e.g. via Skype® or Zoom®) were also used by many families to keep in touch with their older loved ones. Second, an important number of touchscreen tablets were offered by companies to nursing homes during the period where visits to nursing home residents were prohibited. Also, a number of companies have lent their technologies (e.g. robots allowing communication) to nursing homes during the pandemic. Third, some older people used digital telehealth tools (see below) for remote contact with health professionals when they were asked to stay at home. Fourth, technologies were also widely used by healthcare and social care professionals to share information (e.g. nursing homes holding regular webinars with experts from the faculty of medicine) and to share their questions and inspiring practices (see, for example, the technology described below, which was created during the pandemic).

Contribution of technologies to social isolation and loneliness

FAMILINK

FAMILINK²⁵ is a digital photo frame allowing people to share photos remotely with no need for internet access, as it includes a 3G SIM card. It automatically connects to operators and can also be connected to a Wi-Fi network. Users only have to plug in the frame to see the photos received. The whole family can share their photos and everyday moments on the same frame, from their smartphone, via the website or even by email. The frame automatically and instantly displays the photos, along with any captions that accompany them. This photo sharing system allows older people to maintain social ties with loved ones and fight loneliness. Its ease of use allows older people with cognitive impairments to use it without difficulty. The frame costs €149.90 including tax. Beyond the 3 months of 3G/4G service offered, the frame can be used via Wi-Fi for free. A subscription to use the 3G/4G SIM card costs €3.90 a month. Familink allows people to send written messages, information, reminders or a simple hello. It is also possible to order a paper print of the photos sent to the connected frame. We could not find any data on the outcomes or number of users.

CUTII

CUTII²⁶ is a connected autonomous robot, a collaborative platform for remotely connecting with families, and a community of users bringing together individuals, family carers and professional

²⁵ <https://www.familinkframe.com/fr/>

²⁶ <https://www.cutii.io/en/>

caregivers. The robot moves independently thanks to its wheels, but it can only be used indoors. A touchscreen acts as the head. The robot is operated either via the touchscreen or by voice command. A single platform brings together all this robot's functions: (a) connect with loved ones and caregivers (especially in the event of a fall: if it hears "Use Cutii", the robot will call the selected contact persons); (b) scheduled live entertainment activities such as yoga, cultural tours, cooking classes etc.; (c) medical teleconsultation. The non-binding subscription costs €90 a month. Winner of an Award in the "Tech for a better World" category at CES 2017; several user tests have been carried out to improve the functionality of the product. During the period of the COVID-19 lockdown, 30 Cutii virtual companions have been loaned to nursing homes. The start-up that developed the robot was able to start production at scale in early 2020. A first series of a hundred came out. We could not find any data on the outcomes or number of users.

ACTIVIE

Designed by the team under Prof. Pierre Krolak-Salmon and developed by the eHealth start-up Lili smart, ACTIVIE²⁷ is an application that motivates older people to take care of their health and supports them on three major prevention levels: physical activity, social ties and nutrition. Accessible on smartphones, tablets and computers, the application offers personalized goals every day to help people "age well". By adopting good habits, active subscribers accumulate points (for physical activities, nutrition, sleep, etc.) which can be converted into rewards (discounts at local shops, free tickets for cultural establishments, goodies, etc.). Following a questionnaire, Activie offers everyone a programme of activities – walking, challenges, participation in local events, etc. – as well as personalized objectives. The more the user fulfils their objectives, the more points they earn, which they then convert into gifts (cinema and theatre tickets, access to exhibitions, etc.). Started in January 2019, the testing phase included more than 100 users with whom the application was co-constructed, using the principles of "nudge". The ACTIVIE application was officially launched at the end of October 2019 in the Lyon and Villeurbanne sectors, representing 20,000 potential users (it will be integrated into the seniors' digital card). Other cities are showing an interest. We could not find any published data on measured benefits.

Contribution of technologies to mobility

WIMOOV

Losing a spouse, distance, geographic isolation, the loss of functional autonomy or a reduction in financial resources can reduce mobility and increase isolation. Since 2015, WIMOOV²⁸ has worked to provide mobility support solutions for vulnerable senior citizens. In 2018, WIMOOV supported 1,794 older people, who benefited from 168 collective activities with the support of 85 local partner structures. They can enter the system individually or collectively. WIMOOV works with local stakeholders in elder care. Older people can also contact WIMOOV directly, or via a third party or a relative (friends, family,

²⁷ <http://www.activie.fr>

²⁸ <https://www.wimoov.org>

neighbours). The Senior Mobility Skills Assessment consists of establishing a personalized diagnosis to better understand the situation and needs of older people. The mobility advisor plays an important role in reassuring the person by listening to them and making them aware of their potential. WIMOOV offers older people help finding solutions adapted to their specific travel needs: training, for example learning to move using new technologies, administrative assistance in obtaining transport tickets or a guide to suitable mobility operators. We could not find any published data about measured benefits.

SMARTCANE

SMARTCANE²⁹ won the Innovation Award at the 2017 CES. This connected cane is permanently active (no ON/OFF button). Motion sensors provide information about the cane's activity and the user's habits. The Dring service, based on artificial intelligence, is used to report unusual inactivity to caregivers. This detection is effective after several weeks of use. The Dring service monitors its user 24 hours a day. A fall detector built into the cane triggers a pre-alert BEEP if the cane falls. If the person has simply dropped the cane, resetting it vertically will cancel the alert. If the cane falls by itself, there is no pre-alert or alert. In the event of a real fall, the person's loved ones are alerted. When a caregiver replies that they are taking charge of the alert, a care confirmation is sent to the cane. No synchronization with a phone is necessary. The Dring system connects to the GSM network to alert the person's loved ones. The integrated battery lasts several weeks. When the battery is empty, the person receives an SMS request to recharge it. The magnetic charger makes recharging easy. The SMARTCANE costs €129. The subscription to the alert service costs €20 a month. We could not find any published data about the number of users or about measured benefits.

BLUEGARD

BlueGard³⁰ is a support service for people having orientation disorders, especially those living with Alzheimer's disease. It is based on a 24/7 connected watch, commonly known as an Alzheimer's watch or anti runaway bracelet and equipped with a geolocation system. Reassuring for family carers and professional carers, this Alzheimer's GPS bracelet helps to preserve the functional autonomy of people with cognitive disabilities as much as possible. Bracelet wearers can move around a "personalized living area" around their home or nursing home, defined in agreement with their carers and relatives. The perimeter can vary between 150 metres and several kilometres. It thus allows people to move around and get out of their home safely. If wearers move away from the perimeter of their "living area", an alert is sent to a platform which is available 24 hours a day, locating them and immediately contacting the relatives listed during the subscription. Caregivers are guided to them by telephone. The subscription costs €69 a month. We could not find any published data about the number of users or about measured benefits.

²⁹ <https://www.smartcane.fr>

³⁰ <https://bluelinea.com/teleassistance-domicile-senior/bracelet-dautonomie-bluegard/>

Contribution of technologies to personal hygiene

SOLIHA'S AND SAINT-GOBAIN'S TRUCK

SOLIHA's and Saint-Gobain's trucks³¹ are fitted out to make people aware of how their home can be adapted to help them age well, avoid falls and stay at home as long as possible. This mobile information and prevention service criss-crosses France, meeting the inhabitants of all the territories, and carrying specialists in the adaptation of housing. As well as raising awareness among users, these professionals also inform healthcare professionals and carers. The time is also used for discussion to inform users of their rights and financial assistance. Inside the truck is a kitchenette, two showers and a side bench. The walls and floors are covered with PVC panelling. *"They only imitate tiles but save a couple of days of installation"* explains Jean-Philippe Arnoux, who came up with the interior design, working with occupational therapists, and supervised the construction of the rolling showroom. Arnoux also convinced a dozen industrial partners to contribute to this project by donating furniture, ergonomic accessories, brochures and all the equipment necessary to communicate well with private and professional visitors. The mobile showroom allows visitors to imagine themselves in a reassuring environment. It shows a real kitchen, a real shower, real technical aids and comfort, installed in an environment that speaks to people. We could not find any published data about the benefits.

HAPPYTAL

The HAPPYTAL concierge service³² offers some thirty services in hospitals and nursing homes: daily life (washing clothes, care for pets during hospitalization, etc.), entertainment (ordering films, magazines or books), delivery of a specific product to the room (tasty meals, fruit baskets, medication, etc.), relaxation and well-being: hairdressing, cosmetics, pedicures in the room, etc. These services can be ordered from people's room, at the happytal counter, by phone or directly on the Internet, on the company's website. Happytal was created in 2013 and is present in all regions of France. The company provides its services to 110 healthcare institutions (public hospitals, private clinics and nursing homes). Over 25,000 patients are supported each month. It was recently chosen by UniHA, the top bulk-buying network for public hospitals in France, which has 915 member establishments, to appear in its catalogue of products and services for a period of four years. We could not find any published data about measured benefits.

MEDIPAC

In 2014, MEDIPAC, the connected pill organizer from Medissimo, won an award at the CES. LEDs lit up to tell users which box to open. The device was equipped with optical sensors which calculated the variations in weight to detect which box had been emptied. The pill organizer came with a smartphone app that not only reminded people when to take medication, but also alerted a loved one when it had

³¹ <https://sweet-home.info/marches-silver-economie/adaptation-habitat/jean-philippe-arnoux-showroom-adaptation-logement-truck/>

³² www.happytal.com

been done or if they forgot to do it. The pill box cost €250 and required a subscription of €2 a week. It was marketed until 2019. Today, Medissimo sells the MEDIPAC secure pill box³³. It is prepared in pharmacies using the Siapda application. Compliance monitoring can be carried out by a nurse using the web application Siaam, by a caregiver, or by the older person using the QR code for the pill organizer and a smartphone. Medipac is intended to promote compliance by the older chronic patient, with or without the involvement of nursing staff, and to make taking the medication as safe as possible. A study conducted in 2013–2014 showed an improvement in compliance from 77% to 98%. The cost for one month of treatment is €10.80. We could not find any published data about the number of users or about the measured benefits for older patients.

Contribution of technologies to nutrition management

AUXIVIA

To prevent dehydration in older people, Auxivia has developed connected glasses which enable the wearer's water intake to be monitored and tracked³⁴. This technology is intended to reassure family carers when older people live in their own homes, and to give caregivers in nursing homes reliable data to monitor older people's hydration. Auxivia glasses measure the quantities actually drunk. Indeed, their technology allows them to differentiate between gestures indicating that water (or other drinks) is being drunk and those suggesting that the glass has been overturned or thrown. When older people have not drunk enough, a light system reminds them to drink. Connected via Bluetooth to a monitoring platform, the glasses send data automatically and analyse them, ensuring that the water intake is reliably monitored. This platform makes it possible to set a personalized water objective for each person monitored, and alerts staff in the event of insufficient hydration. The Auxivia connected glass is resistant to dropping, is dishwasher safe and has an ergonomic shape suited for older people with disabilities. We could not find any published data about the number of users or measured benefits.

PROTIBASE

Undernutrition in older people is a public health issue with serious consequences. However, intervening in this field presents an olfactory challenge (old age is accompanied by a significant loss of the sense of smell), as well as a challenge to older people's physical capacities. The *Renessens* project teams (involving, in particular, the Dijon University Hospital, the Dijon Center for Taste and Food Sciences and the Scinnov laboratory) found that, when people are faced with chopped, mixed or mashed foods, texturing and enrichment solutions are more effective and more appreciated. As part of the project, several innovative products were developed and tested in nursing homes, including a protein-enriching powder, Protibase³⁵. It does not bleach the preparations, can be heated without coagulating and can be concentrated without causing nausea in eaters. Its taste is neutral, which means it can be used in

³³ <https://www.medissimo.fr/pilulier-medipac/>

³⁴ <https://auxivia.com/verre-connecte/>

³⁵ <https://www.vitagora.com/blog/2019/solutions-renessens-senior-alimentation/>

breakfast drinks (tea, coffee etc.), sweet preparations (yoghurts, compotes etc.) or savoury food (soups, gazpachos). Consequently, it can be incorporated throughout the day and is not infantilizing. We could not find any published data about the number of users or measured benefits.

E-NUTRIV

The purpose of the E-NUTRIV project³⁶ is to identify cases of undernutrition in older people and to alert their relatives and ensure the situation is meticulously monitored. Using connected objects (including a weighing pad and a connected tablet), the program will be able to monitor people's weight and issue an alert if it decreases. The alert will then be sent to relatives of the senior and those around him or her, so that action can be taken as quickly and as effectively as possible before the problem gets worse. The program is currently in its experimental phase. It has been set up with 1,000 Alsace residents aged 70 and over. These older people live at home with no or few disabilities. The weighing pad is installed in the older person's home. A mutual aid platform is set up to facilitate cooperation between undernourished people, their relatives and professionals providing personal services. The system will allow the communities thus created to share their information and put in place possible solutions to fight this undernutrition. No data have yet been published about the measured benefits.

Contribution of technologies to cognitive and communication skills

X-TORP

Prof. Philippe Robert of Nice University Hospital has joined forces with the Genius Group X-TORP to develop a therapeutic naval battle video game. Its usability and impact on health were studied in a clinical trial³⁷. Aimed at people with mild Alzheimer's disease, this serious game is a multi-player naval battle game that combines cognitive and motor activities. "The patients are interested, happy, especially the men" says Prof. Robert. Indeed, one of the characteristics of this game is that it targets males more than females. X-TORP is the first game to measure the progression of Alzheimer's disease while stimulating patients' cognitive capacities. Offering the possibility of playing with family or friends, this tool is also intended to promote physical activity and social ties. In this adventure game, the patient is on board a submarine and has an immersive gaming experience combining survival, resource management and naval battles. The Kinect™ camera then makes it possible to record the data of the game to transmit it to the therapist in charge of the follow-up. We could not find any published data about the number of users or about measured benefits.

FANNY (Dynseo)

Dynseo is developing a platform of health services and applications on tablets for older people and for healthcare professionals, as well as anyone with a disability³⁸. Dynseo works with healthcare

³⁶ <https://www.apamad.fr/e-nutriv-detecter-risques-de-denutrition-personnes-agees/>

³⁷ <https://www.groupe-genious.com/x-torp-le-premier-jeu-video-therapeutique-a-destination-des-patients-alzheimer-valide-cliniquement/>

³⁸ <https://www.dynseo.com/nos-produits/fanny-lassistant-personnel-du-senior-a-domicile/>

professionals to design prevention and rehabilitation tools, as well as standardized detection tools. For older people, the goal is to prevent cognitive impairment and maintain social and intergenerational ties. FANNY is a senior home voice assistant designed to support seniors on a daily basis, to stimulate them with pleasant and cultural games, to help them maintain social ties and organize daily life, but also to warn a loved one if necessary. FANNY offers many services: reminders of appointments and scheduled events, and different games (culture quiz, mental maths game etc.). FANNY will also be able to start a discussion, switch on the radio, give the weather forecast and search the Internet, as well as alerting the family if there is a problem. It costs €150. We could not find any published data about the number of users or about measured benefits.

EXOSTIM (GlobalStim)

The personalized, customizable cognitive stimulation program, EXOSTIM is a brain coach focusing on perception, language, memory and reasoning³⁹. Different activities were first created on paper and later turned into an application intended for tablets. The EXOSTIM approach aims to create appealing cognitive stimulation with content that is personalized and can be adapted by medical teams. EXOSTIM is intended for professionals and family carers. It allows a cognitive profile of the user to be set up and one adapted work program to be selected. What makes EXOSTIM particularly effective for cognitive stimulation is thus the fact that the work programs can be individualized to meet beneficiaries' needs. Occupational therapists, psychologists, psychomotor therapists, neuropsychologists, medico-psychological assistants and caregivers specialized in gerontology are given precise knowledge of beneficiaries' cognitive status and save time spent preparing activities. We could not find any published data about the number of users or about measured benefits.

Contribution of technologies to behavioural and psychological issues

MUSIC CARE

MUSIC CARE⁴⁰ is a music therapy application developed by Stéphane Guétin in partnership with the Montpellier University Hospital Center (Prof. Jacques Touchon) and the National Institute of Health and Medical Research. It offers an individualized music intervention session using a standardized protocol. It also can train healthcare staff in using these techniques. Studies have shown that MUSIC CARE can help reduce anxiety and behavioural problems and reduce the use of medication in people living with Alzheimer's disease (Guetin et al., 2009). Decreases of over 50% in anxiety and depression have been observed. MUSIC CARE is also used in older patients without cognitive impairment who suffer from chronic pain (low back pain, fibromyalgia, inflammatory or neurological pathology). The combination of standard analgesic treatment and music therapy reduces pain by around 50% and halves the consumption of anti-anxiety drugs or antidepressants, with the effect being maintained for one month after the sessions (Guetin et al., 2012). The sessions are adapted to the tastes and needs of the

³⁹ <https://exostim.com>

⁴⁰ <https://www.music-care.com>

patients. The device can also be used before or after surgery. We could not find any data about the number of users.

NAO-ZORA

NAO-ZORA⁴¹ is an 8 kg humanoid NAO robot with three fingers on each hand, equipped with software specifically developed for use in healthcare institutions such as nursing homes or rehabilitation units. It is equipped with four directional microphones and speakers enabling it to listen and speak to those around it in a fluid way. It is also equipped with sonars and helped by sensors located in its head, feet and hands. Thus, ZORA has a precise image of the environment in which it operates. ZORA can be used by different specialities: occupational therapists, psychomotor therapists, nurses, nursing assistants, psychologists, etc. For patients/residents, ZORA is intended (a) to slow down cognitive decline via interactive games, (b) to transform physical exercise and gentle gymnastics sessions into playful sessions, and (c) to create a new type of entertainment (to sing, dance, play bingo, memory games). During a group session, ZORA can allow professionals to focus on and correct residents' movements in real time, without having to stop the exercise. ZORA can also allow individual interaction. In both cases, an engineer at a computer dictates the robot's actions, bringing it to life like a puppet. We could not find any published data about the number of users or about measured benefits.

PARO

PARO⁴² is a socio-educational robot that looks like a small stuffed seal, covered with synthetic fur with bactericidal fibres. About fifty centimetres long and weighing 2.5 kg, it works with artificial intelligence: 7 motors allow it to move its head, blink its eyes, wag its tail and activate its two fins. A dozen sensors (touch, positioning, light) and three microphones (to detect where a sound comes from by triangulation) send information back to artificial intelligence software which consequently adapts its intonations and movements according to the behaviour of the person holding it. PARO can communicate emotions such as joy or surprise. A form of animal therapy, PARO is used in addition to non-pharmacological interventions and can, under certain conditions, provide clinical benefits such lowering blood pressure and heart rate, reducing stress and anxiety levels, preventing depression, etc. PARO is also used to improve people's communication and social interactions. PARO has been developed with the aim of offering at least the therapeutic advantages of animal-assisted therapy while limiting the associated disadvantages: anxiety linked to scratches, bites, allergies, hygiene, etc. One recent study summarizes the published benefits and barriers (Hung et al., 2019).

LUMEEN

LUMEEN⁴³ is a medical device which allows nursing homes to relax, stimulate and entertain their residents using immersive group experiences. Virtual reality headsets simultaneously transport up to 6

⁴¹ <https://inno3med.fr/zora-le-robot-dassistance-en-etablissements-de-sante/>

⁴² <https://www.phoque-paro.fr>

⁴³ <https://lumeen.com>

older people into a context for relaxation (by the sea, in the forest, in the mountains, etc.), stimulation (museums, cultural sites, exhibitions) and entertainment (opera, shows, concerts, circus, etc.). The technological barrier is removed for residents, who have nothing to do except to benefit from the experience. Before the experience, an introduction is provided to the facilitator to open a discussion, and after the experience a quiz is provided to promote social cohesion and stimulate the participants' memory. LUMEEN can also be used individually, at home. It is already in use in 20 nursing homes and will soon be used in the 35 nursing homes of the French Red Cross. We could not find any published data about the measured benefits.

Contribution of technologies to personal safety and security

DOMASSIST

The DOMASSIST project⁴⁴ aims to design a home assistance device and validate its effectiveness. The technology must be accessible to as many people as possible, whether in terms of the financial cost, rural or urban location, type of housing, or technological skills. The DOMASSIST platform links communicating objects placed in the person's home: wireless sensors/actuators which are available in large stores at a low cost (motion detector, touch detector, electrical outlet controller, etc.); software services (shared agenda, Internet resources) and two touchscreen tablets. The aspects to be covered are (a) monitoring and assessing activities (eating meals, washing, dressing, getting up and going to bed, etc.), (b) safety of people and their home (light path, supervision of the stove, alerting a caregiver in the event of an unusual or worrying situation), and (c) social participation through communication and leisure activities, (simplified email service, videoconference call application and personalized leisure applications). A new project, called DomAssist500, will recruit a thousand older people living in Aquitaine, five hundred of whom will be equipped with the DomAssist solution. This large-scale study will provide a scientific framework for the evaluation of personal assistance technologies. No data have yet been published about the measured benefits.

BALTO PROTECT

BALTO PROTECT (SeniorAdom)⁴⁵ is a remote assistance system that automatically detects behavioural anomalies that may be the consequences of falls, discomfort or cognitive weaknesses. BALTO PROTECT will mainly analyse people's movements and the average time they stay in a room. It thus makes it possible to detect critical situations such as the abnormal lack of movement following a fall, or discomfort. Motion sensors are arranged in each room of the accommodation to detect falls, without using photographs or cameras. The system also includes one door opening detector, three call buttons, one integrated multi SIM card enabling it to communicate without a telephone jack or Internet cable, and an integrated temperature sensor to measure whether the temperature becomes very hot or cold. In the event of an anomaly being detected, an alert is sent to the person's loved ones or to the help centre.

⁴⁴ <https://interstices.info/une-assistance-numerique-pour-les-personnes-agees-le-projet-domassist>

⁴⁵ <https://www.senioradom.com>

This checks up on them via the intercom system built into the box. It then follows a procedure that the person defines with his/her close relations. No data have yet been published about the measured benefits.

DOMOPACK LUMIERE

When people living at home make the trip from their bed to the toilet at night, they are at particular risk of accidents as they may be sleepy or under the influence of drugs. The “Domopack lumière”⁴⁶ automatically turns on the lights to make their night-time journey safer. It helps the person to move by providing non-dazzling, automated lighting. As soon as the person gets out of the bed, the remote motion detectors installed along the route (bedroom, corridor, toilet) trigger the lights in a timed fashion so that they go out when the person has returned to their bed. The elements communicate with each other wirelessly within a range of 150 m without obstacles, or 15 m through a wall, so there are no wires to install. The Corrèze General Council tested these home automation solutions for 18 months (ESOPPE project) with around one hundred older people. The team led by Prof. Dantoine of the Limoges University Hospital observed that (a) the light path reduced the number of falls by two thirds, (b) the risk of hospitalization was also reduced by two thirds (Tchalla et al. 2012). The lit route was approved by the majority of older people in the study. The “Domopack lumière” costs €130 including tax. We could not find any published data about the current number of users.

Contribution of technologies to high-need care for high dependence

LOVISION

Many older people have vision problems. For instance, age-related macular degeneration (AMD) is the number one cause of blindness in people over the age of 50 in industrialized countries. In France, we can estimate that more than 1.5 million people live with minor or major signs of AMD. This electronic magnifying glass is placed on a document and a camera scans the images and text, which is either read in a synthesised voice or presented for easy reading. A screen displays the content seen by the camera and displays the desired magnification (from 5 to 20 times). Unlike a hand-held optical magnifier, there is no need to move the device forwards or backwards to obtain optimal clarity: zoom buttons allow you to focus on certain areas or to see them all. The electronic magnifier does not distort the displayed content, and several levels of enlargement are available. The LOVISION portable electronic magnifier⁴⁷ is designed to allow older people to continue enjoying the pleasures of reading and easily read books, letters, administrative documents and cooking recipes. It costs €289. We could not find any published data about the number of users or about measured benefits.

DYNAMIC LIGHTING

People with cognitive disorders, e.g. Alzheimer’s disease, may be confused about what time it is. Through dynamic lighting, nursing home residents can benefit from a new ease of living in their room and in the institution thanks to the visual comfort generated by the LED lights: soft, automatically varied

⁴⁶ <https://www.tousergo.com/lampe/4202-detecteur-de-mouvement-domopack-lumiere-3414970863164.html>

⁴⁷ <https://www.tousergo.com/loupe/1718-loupe-electronique-portable-lovision-3661474252790.html>

indirect lighting, or high quality and contrasts with direct lighting. By playing with colours, the ECO 2 LED wall lamp⁴⁸ can recreate the cycle of natural light (morning: yellow/white light; noon: white light; evening: yellow/orange light): dynamic lighting which imitates the appearance of time passing. Dynamic lighting that recreates changes in the colour of sunlight helps synchronize residents' biological clocks. We could not find any published data about the number of users or about measured benefits.

Contribution of technologies to life and care planning in the context of uncertainty

TOUS AIDANTS

TOUS AIDANTS (“All Caregivers”)⁴⁹ is a free mobile application allowing family caregivers to manage their relatives' daily lives, organize meetings remotely, transmit information to other family members, even at a distance, communicate easily and interactively with them for better time management, and benefit from rich, relevant information. The app allows caregivers (a) to enquire about availability and coordinate everyone's schedules, (b) to share information (appointments, behaviour, tasks to be accomplished or important documents) necessary for the smooth running of the visits while maintaining appropriate confidentiality, (c) to watch over the older person remotely, thanks to specific functionalities including a digital connection book. The app thus makes it easy to coordinate visits and care between family and professionals, share information and useful documents in complete confidentiality, and monitor a loved one's progress through the day, even at a distance. It is available on smartphones, tablets and computers. We could not find any published data about the number of users or about measured benefits.

ORIANE (Korian)

ORIANE⁵⁰ is a global service combining home intervention by professional carers with a digital platform allowing discussion between cared-for people or their relatives, health professionals (nurse, GP) and referral teams. The platform allows various stakeholders to coordinate and exchange information in real time in a secure place. A health advisor, also a nurse, works on prevention and sends alerts related to falls, loss of abilities, weight changes or mood changes. The health advisor is available every day to answer questions from older people and their family, and is also responsible for organizing travel to the hospital. This system also involves adapting the apartment to reduce the causes of falls, for example by fitting grab bars, a bathtub chair or light paths. A 24-hour remote assistance system is provided to detect falls and fires. The fourth service comprises hairdressing services at home, meal delivery or the organization of cultural outings. The platform includes a personal space for clients and their family (contacts, appointments, messaging) and a secure space for health professionals who work with them and have different levels of authorization. The ambition is to reach 15,000 customers by 2023. We could not find any published data about measured benefits.

⁴⁸ <http://docdif.fr.grpleg.com/general/ouidoo/pdf/legrand-intervox-guide-mieux-vivre-chez-soi.pdf>

⁴⁹ <https://lacompaniedesaidants.org/service/tous-aidants-lapps-mobile/>

⁵⁰ <https://www.korian.com/fr/blog/oriane-la-nouvelle-offre-de-services-domicile-pour-les-seniors-du-groupe-korian>

Contribution of technologies to digital literacy

EMMAÛS CONNECT

When it comes to digital inclusion, the issues are extremely diverse, e.g. tax declarations, administrative procedures, access to rights. Since 2013, EMMAÛS CONNECT⁵¹ has been working to allow the digital inclusion of the most vulnerable. It offers workshops of all levels to develop online autonomy. It is creating regional digital inclusion programmes with the major players in digital transformation. On arrival, people in difficulty are invited to carry out a “digital diagnosis” with an adviser. This is an essential moment of listening to measure their level of familiarity with digital tools. This diagnosis allows EMMAÛS CONNECT to offer them a specially adapted course of support and related offers (phone credit, a smartphone, etc.) to suit each beneficiary’s budget. 40,000 people with digital difficulties have been supported in six regions. Thanks to partnerships, EMMAÛS CONNECT offers its beneficiaries prepaid phone and internet top-up offers at discounted prices. 705,000 phone and internet top-ups have been provided at these prices. EMMAÛS CONNECT offers beneficiaries’ free courses giving them a minimum level of digital knowledge. Most often run by volunteers, these courses are to help people get used to a computer or smartphone; to surfing the internet, using an electronic mailbox, etc. We could not find any published data about measured benefits.

ARDOIZ (La Poste)

“La Poste”, the French postal service, has developed ARDOIZ⁵², its connected tablet service suitable for older people. This is installed seven times out of ten by a postal worker. ARDOIZ is easy to use for newcomers to computing, with adapted ergonomics: protruding buttons for easy use, a carrying case which enables the tablet to be put in desktop mode, a pen-sized stylus for more precise use, a micro-USB cable to connect any USB stick and transfer photos, videos and documents, a detailed user guide which can be propped up next to your tablet as you explore its functions, a Qwerty or alphabetic keyboard, adjustable character sizes, a simplified internet browser, games for all tastes and all levels, easy sharing of photos and videos, video calls with Skype®, selected press contents, etc. At the start, users can be helped by a postal worker in their home (installation, configuration, user advice). The price is €199 + €9.99 a month. We could not find any published data about the number of users or about measured benefits.

SOLIDARITÉ NUMÉRIQUE

The website solidarite-numerique.fr offers help for people who do not know how to use essential online services. It offers more than 230 resources (tutorials, links to YouTube® channels, useful websites, etc.). This platform contains several practical sections: getting started with the internet and computer tools (using an electronic mailbox or a mobile application, etc.); carrying out administrative procedures online; communicating with loved ones (Skype® calls, communicating using a mobile application, etc.);

⁵¹ <https://emmaus-connect.org>

⁵² <https://www.inc-conso.fr/sites/default/files/pdf/tablettes-seniors-tableau.pdf>

consulting a doctor remotely; shopping on the Internet (click and collect, direct farm sales, etc.); finding verified information (official sites, fact-checking tools, etc.). For people who do not have access to a computer or the internet, there is also a toll-free call centre, available Monday to Friday from 9 a.m. to 6 p.m. Advice is provided by one of 700 volunteer digital mediators. We could not find any published data about the number of users or about measured benefits.

Contribution of technologies to accessing formal and informal care

POUR LES PERSONNES ÂGÉES (“FOR OLDER PEOPLE”) (CNSA)

“Pour les personnes âgées” (“For older people”)⁵³ is the national information portal for older people and their relatives run by the French Government and presented by the CNSA. It helps people find, identify the main characteristics of, and compare the prices of (a) community healthcare services, (b) homecare services and (c) nursing homes. It also presents a list of local centres whose mission is to inform older people and their relatives. Many online services and forms are available to simplify the procedures people go through. Some articles have been written according to European rules on making information “easy to read and understand”. Created in 2015, the portal now provides contact details for more than 16,000 resources for older people and their loved ones (services, institutions, or information points). The site has received more than 16 million visits, with 5 million in 2019 alone. We could not find any published data about measured benefits.

DIGITAL TELEHEALTH TOOLS

Several digital innovations enable remote access to a healthcare professional. They are not reserved for older people, but can be particularly useful to them, especially in these times of a pandemic crisis. For instance, the CONSULT STATION telemedicine booth⁵⁴ (from the company H4D) brings together all the measurement and investigation instruments necessary to manage patients by videoconference. This telemedicine solution allows doctors to perform a clinical examination remotely, make a diagnosis and issue a prescription. E-OPHTALMO⁵⁵ is a specialized network for teleophthalmology. It facilitates access to screening for the main eye diseases, the prescription of an appropriate optical correction and teleconsultation. LIVI⁵⁶ is a teleconsultation solution which aims to connect healthcare professionals (general practitioners, dentists, midwives, etc.) and patients. The objective is to facilitate access to care and improve medical follow-up for all patients. This service is particularly suitable for patients who want a rapid opinion, advice or diagnosis for the most common reasons for consultation (fever, cough, inflammation, etc.). We could not find any published data about the number of users or about measured benefits.

⁵³ <https://www.pour-les-personnes-agees.gouv.fr>

⁵⁴ <https://www.h4d.com/cabinet-medical-connecte/>

⁵⁵ <https://www.e-ophtalmo.com>

⁵⁶ <https://www.livi.fr>

ÔGÉNIE (Engie)

ÔGÉNIE⁵⁷, the Engie Group's start-up, is developing a social innovation service dedicated to collective housing. This connected services platform promotes intergenerational solidarity and aims to develop support services and participate in the process of home care for older people. ÔGÉNIE is a "PhiGital" service (combining both digital and physical services) dedicated to collective housing (mixed collective housing, assisted living, intergenerational residences, etc.). The service covers several spheres of action. For property managers: messaging, surveys, promoting entertainment, or information and prevention campaigns. For residents: advice on well-being, messaging between residents, residence events calendar and entertainment news, teleassistance box directly linked to the caregiver or the teleassistance centre, health records and social care coordination book. For caregivers: a mobile application offering access to messaging or a discussion group between caregivers and with older people, sending messages to voicemail, tracking connected objects. We could not find any published data about the number of users or about measured benefits.

MON ÉMILE

MON ÉMILE⁵⁸ is a website made to support and offer services adapted to the older people who need it most. Keeping social ties, continuing to have activities, accessing an adapted transport service, coping with a disease in all its aspects and adapting their housing to their situation are widespread problems faced by older people. It can be complicated to have access to information and know who they can trust, and they sometimes end up giving up in the face of difficulty. MON ÉMILE offers personalized support in three phases: a personalized assessment, solutions proposed thanks to a network of partners, and follow-up. The price of the subscription originally ranged from €49 to €199. Since the COVID-19 crisis, this part of the start-up's activities is organised via a non-profit association which aims to support older people on a voluntary basis in their daily lives but also to break their isolation and listen to them. Delivering groceries and medication, help using digital tools, etc.: the assistance provided by the association can take many forms depending on the needs of the person being helped. We could not find any published data about the number of users or about measured benefits.

Contribution of technologies to formal and informal carer's skills

EHPAD'PANIC (Genious)

EHPAD'PANIC⁵⁹ is a serious game for professional caregivers; an application combining leisure and motivation, intended to facilitate learning and social interaction in a context of activity. The content of EHPAD'PANIC came from the experience gained during the programme "Non-pharmacological interventions in nursing homes" set up by Prof. Philippe Robert from the University of Nice. The game is a role play in which the player is a nurse. During the game, the player has to perform various daily

⁵⁷ <https://www.ogenie.fr>

⁵⁸ <https://monemile.fr>

⁵⁹ <http://www.ehpad-panic.com>

tasks, such as providing treatment, while simultaneously managing the psychological and behavioural symptoms of dementia. The authors describe this as a good way to see if skills and know-how have been well integrated. We could not find any published data about the number of users or about measured benefits.

AIDANT & EVE (Genious)

AIDANT & EVE⁶⁰ is a complete tool which helps family caregivers of people living with Alzheimer's disease or another neurocognitive disorder to get to know them better and support them on a daily basis. Through concrete situations, caregivers can experience the difficulties of everyday life in a pleasant, independent way. Practical advice at the end of each situation offers tips and tricks for better understanding these difficulties. Caring for a loved one living with cognitive disabilities can be time-consuming and overwhelming. Healthy lifestyle advice is given to caregivers as a reminder to care of and protect themselves. A discussion forum is provided where they can share their experiences both with other caregivers and with professionals. Caregivers can share tips and tricks and suggest solutions to other caregivers. They can also discuss the latest news on the disease, its management and research. In addition to the forum, a series of monthly videos is available. Resources and advice sheets written by experts help caregivers manage their loved one's illness, learn how to deal with them and manage their daily behaviour. We could not find any published data about the number of users or about measured benefits.

ENTRAIDE (Cercle Vulnérabilité et Société / French Red Cross / Arbitryum)

ENTRAIDE⁶¹ is a web platform Created during the COVID-19 crisis for professionals and volunteers involved in healthcare, elder care and disability care to build and share good practices. The platform allows each professional or volunteer to ask questions and benefit from the responses provided by the community, sorted into several degrees of urgency. This helps collect, accumulate and disseminate practices developed in the field to facilitate decision-making in the face of the organizational and human problems confronting professionals and volunteers. ENTRAIDE aims to allow economies of scale in terms of resources and implementation times, to make contributors feel less alone, to improve their quality of life at work and to rationalize the situations encountered. The open format favours feedback and the aggregation of information, and makes it possible to monitor how the situation is developing on the ground. We could not find any published data about the number of users or about measured benefits.

5.2.3 Summary

The aim of this section is to discuss whether the technologies described in the previous section can contribute to good later life and help achieve the points made in the vision statement about good elder

⁶⁰ <http://www.aidant-et-eve.fr>

⁶¹ <https://entraide.arbitryum.fr>

care. In other words, is the framework described in the first section supported by the technologies described in the second section? Generally speaking, one can say that there is a relatively good fit between the French elder care framework and the technologies that are being developed for older people. First, three examples of technologies can be found in almost all the categories proposed (social contact and interaction, mobility, personal hygiene, nutrition, cognitive and communication skills, behavioural and psychological issues, safety and security, high-need, life and care planning, digital literacy, accessing care, carer skills). This means that digital solutions have very diverse aims which are not limited to healthcare or medical care. In other words, the digital solutions presented relate to many aspects of older people's lives: they do not assume that ageing equates with disease, or disability. Importantly, a number of technologies are available to maintain social contact and interaction, and especially intergenerational relationships. What is more, many technologies try to help older people compensate for any difficulties in mobility, cognition, communication and planning, so as to have the best possible life even if they experience a disability.

However, there are limitations as to what is available. First, we find a lot of technologies dedicated to promoting older people's functional autonomy and quality of life, but few technologies dedicated to entertaining older people or promoting access to nature, culture, leisure or spirituality. These may not relate directly to care but do contribute to a happy later life. Second, we could not find any example of a technology truly dedicated to giving voice to older people, and to older people receiving care. Digital solutions could certainly promote the empowerment of older people, and examples of this are found in other parts of the world. See for instance how the Dementia Alliance International, an organization of people living with dementia, uses technologies to make their voice heard⁶². We could not find any similar examples in France. Second, the technologies presented in the previous section are clearly promoting a paradigm of care that is not disease- or disability-centred, but instead oriented towards the individual person's strengths, towards prevention, rehabilitation, living safely at home, and inclusion in the community. Their aim is to help older people live independently or "age in place" for as long as possible, make their own choices and decisions, stay connected with their loved ones, and so on. Therefore, the technologies presented could help implement a new paradigm of elder care, promoting older people's capabilities and helping them live a life inspired by their own values and preferences. In other words, the increasing use of technologies in elder care does not necessarily mean that elder care is going to be less human, less warm, or less thoughtful. On the contrary, technology could be a unique opportunity for older care to move from a disease-centred and sometimes paternalistic approach of care to a person-centred approach to elder care, based on the older person's capabilities.

Here too, two observations may add reservations to this analysis. First, as we have pointed out, the most promising innovations in elder care combine technological and social innovation. A technology can lead to an improvement in the quality of care if it does not replace human intervention; if it is not intended to compensate for an absence or shortage of qualified personnel. The most positive outcomes of care

⁶² <https://www.dementiaallianceinternational.org>

technology are observed when technology does not replace human intervention but rearranges it; when technology is only intended to supplement a human presence and caring. Second, as noted earlier, careful ethical oversight is needed, from the conception and development of care technologies to their implementation and use in current practice. Technologies are becoming more and more miniaturized and could therefore be used without a person's consent or agreement. Since they are increasingly being used in real life, capturing very personal details of people's everyday lives, there is a greater need to protect their privacy and confidentiality. Moreover, since a growing number of elder care technologies are not medical products but consumer goods, increased scrutiny of sales strategies is needed to counter the financial abuse of older people.

Finally, many elder care technologies still have a relatively modest user base. However, during the COVID-19 pandemic, a number of digital solutions have been offered or lent to older people, and to care services and institutions. This could promote the dissemination of solutions that have truly been considered appropriate and meaningful not only by their developers but also by older people themselves and by their professional and family carers.

5.2.4 References

- Biancarelli G., Bouvier, M., Burgade, L., Kuhn-Lafont, A., & Lacheray, M. (2019). Grand âge et numérique: objectif 2030. Rattraper le retard français. Les études de Matières Grises, n°3. https://www.ehpa.fr/pdf/think_tank_rapport_3.pdf
- Brugère, S., & Gzil, F., (2019). Vieillesse et nouvelles technologies: enjeux éthiques et juridiques. Pour des technologies au service des capacités et du bien commun. <https://www.france-silvereco.fr/plugin-documentation/doc/47.pdf>
- CNSA (Caisse Nationale De Solidarité Pour L'Autonomie) (2018). Démarche prospective du conseil de la CNSA. Pour une société inclusive ouverte à tous. https://www.cnsa.fr/documentation/web_cnsa_13-08_dossier_prospective_exe1.pdf
- CNSA (Caisse Nationale De Solidarité Pour L'Autonomie) (2019). Démarche prospective du conseil de la CNSA. Chez-soi: l'approche domiciliaire. https://www.cnsa.fr/documentation/cnsa_19-07_prospective_chapitre_2_web.pdf
- CNSA (Caisse Nationale De Solidarité Pour L'Autonomie) (2020). Les chiffres clés de l'aide à l'autonomie 2020. https://www.cnsa.fr/documentation/chiffres_cles_2020.pdf
- CCNE (Comite Consultatif National D'Éthique) (2018). Enjeux éthique du vieillissement. Avis n°128 du 15 février 2018. https://www.ccne-ethique.fr/sites/default/files/ccne_avis_128.pdf
- Dufeu-Schubert, A. (2019). Réussir la transition démographique et lutter contre l'âgisme. <https://solidarites-sante.gouv.fr/ministere/documentation-et-publications-officielles/rapports/personnes-agees/article/reussir-la-transition-demographique-et-lutter-contre-l-agisme>

- El Khomri, M. (2019). Plan de mobilisation nationale en faveur de l'attractivité des métiers du grand âge 2020-2024. <https://solidarites-sante.gouv.fr/ministere/documentation-et-publications-officielles/rapports/personnes-agees/article/rapport-el-khomri-plan-de-mobilisation-nationale-en-faveur-de-l-attractivite>
- Espace De Réflexion Éthique D'Île-De-France (2017). Valeurs du soin et de l'accompagnement en institution. <https://www.espace-ethique.org/ressources/charte-declaration-position/charte-valeurs-du-soin-et-de-laccompagnement-en-institution>
- Espace De Réflexion Éthique D'Île-De-France (2016). Éthique et relations de soin au domicile. <https://www.espace-ethique.org//ressources/charte-declaration-position/charte-ethique-et-relations-de-soin-au-domicile>
- Filière Silver Économie (2020). Recensement des solutions et outils améliorant la vie quotidienne des personnes âgées. <https://www.gerontopole-paysdelaloire.fr/sites/default/files/inline-files/Silver%20Economie%20-%20Annuaire%20des%20solutions.pdf>
- Gerond'if (2020). Les solutions numériques pour rompre l'isolement des séniors pendant le confinement. <https://www.gerondif.org/single-post/2020/03/30/Les-solutions-numeriques-pour-rompre-lisolement-des-seniors-pendant-le-confinement>
- Guedj, J., Broussy, L., & Kuhn-Lafont, A. (2018). Les personnes âgées en 2030. Les études de Matières Grises, n°1. https://www.ehpa.fr/pdf/think_tank_rapport.pdf
- Guetin, S., Portet, F., Picot, M. C., Pommie, C., Messaoudi, M., Djabelkir, L., Olsen, A. L., Cano, M. M., Lecourt, E., & Touchon, J. (2009). Effect of music therapy on anxiety and depression in patients with Alzheimer's type dementia: randomised, controlled study. *Dement Geriatr Cogn Disord* 28, 36–46.
- Guetin, S., Giniès, P., Siou, Kong A Siou, D., Picot, M. C., Pommié, C., Guldner, E., Gosp, A. M., Ostyn, K., Coudeyre, E., & Touchon, J. (2012). Effect of music intervention in the management of chronic pain: a single blind randomized, controlled trial. *Clin J Pain*, 28(4), 329–37.
- Gzil F et al. (2018). Alzheimer ensemble: trois chantiers pour 2030. Organiser la prévention, améliorer l'accompagnement, bâtir une société inclusive. <https://www.fondation-mederic-alzheimer.org/trois-chantiers-pour-2030>
- Hung, L., Liu, C., Woldum, E., Au-Yeung, A., Berndt, A., Wallsworth, C., Home, N., Gregorio, M., Mann, J., & Chaudhury, H. (2019). The benefits of an barriers to using a social robot PARO in care settings: a scoping review. *BMC* 19(1): 232.
- Kenigsberg, P. A., Aquino, J.P., Bérard, A., Brémond, F., Charras, K., Dening, T., Droës, R. M., Gzil, F., Hicks, B., Innes, A., Nguyen, S.M., Nygård, L., Pino, M., Sacco, G., Salmon, E., Van der Roest, H., Villet, H., Villez, M., Robert, P., & Manera, V. (2017) Assistive technologies to address capabilities of people with dementia: from research to practice. *Dementia*, 18(4), 1568–1595.

- Libault, D. (2019) Rapport de la concertation grand âge et autonomie. <https://solidarites-sante.gouv.fr/ministere/documentation-et-publications-officielles/rapports/personnes-agees/article/rapport-de-la-concertation-grand-age-et-autonomie>
- Michel, H., Picard, R., Prévot-Huille, H., & Letourneau, D. (2018). L'avenir des Silver Tech: Conception, usage, évaluation. Fondation de l'Avenir, Presses de l'EHESP.
- Mutualité Française (2016). Télémedecine en EHPAD mutualiste. <https://www.fondationdelavenir.org/la-telemedecine-en-ehpad-mutualistes/>
- Mutualité Française (2018). L'utilisation du robot PARO dans les EHPAD auprès de résidents atteints de troubles cognitifs. <https://www.mutualite.fr/actualites/robot-paro-un-rapport-evalue-son-usage-en-ehpad/>
- Petits Frères Des Pauvres (2018). L'exclusion numérique des personnes âgées. <https://www.petitsfreresdespauvres.fr/informer/prises-de-positions/contre-l-exclusion-numerique-de-4-millions-de-personnes-agees>
- Tchalla, A. (2012). Efficacy of simple home-based technologies combined with a monitoring assistive center in decreasing falls in a frail elderly population (results of the ESOPPE study). *Arch Gerontol Geriatr* 55(3), 683–689.

5.3 National report: Germany

Anne Meißner

5.3.1 A brief introduction to the country

The Federal Republic of Germany consists of 16 states with some degree of sovereign power. Due to Germany's federal structure, political decision-making in care is scattered, as in other areas. The federal government makes the law, and the states implement it. This means that the law can differ, sometimes even at neighbouring addresses, which is occasionally difficult for the population to understand.

Germany's care system offers a specific level of benefits and does not cover the full costs of care. Any remaining costs of care exceeding this level must be paid by the person in need of care. Only if it is stated to be necessary by the government does social assistance pay for people with exceptionally low means. The costs of the care system are rising. There are various political responses to counteract this. Nevertheless, today individuals are confronted with rising costs and rely more heavily on social assistance, since the actual costs of care have exceeded the changes in benefits. Discussions are being held on introducing a cap on individual care costs.

Care service providers are organized as municipal, non-profit, or private organisations. In recent years there has been a concerning expansion of the private sector. In Germany, the highest returns can be achieved with nursing homes: an average yield of 4.7% to a peak of 8%. In 2017, there were more changes of ownership than ever before, valued at around €1 billion (Heger et al. 2017). There are regional differences, with some municipalities in which the age structure is high, yet the long-term care rate is nevertheless relatively low (DeStatis 2018, SVR 2014). Estimates suggest that somewhere between 4 and 5 million informal carers are involved in providing care. In addition, the number of both legal and illegal migrant care workers is constantly increasing (Rada 2016).

As of December 2019, Germany has 83.1 million inhabitants [42.1 million women | 41 million men; (DeStatis 2019c)]. In 2018, 17.9 million people in Germany were over the age of 65 (DeStatis 2019a). Of these, 3.4 million needed care⁶³ within the meaning of long-term nursing insurance. Of these 3.4 million people, 76% were cared for at home and 24% within the long-term care market. In total, 81% of those in need of long-term care were aged 65 and older, and more than a third (35%) were at least 85 years old. The majority of those in need of long-term care were female (63%) (DeStatis 2018). One particularly rapidly growing group of older people is the oldest old. In 1991, just under 1.2 million people were aged 85 and older. By 2018, their number had risen to 2.3 million. This means that it had almost doubled and, in relative terms, risen much more strongly than the overall number of people aged 65 and over [+ 49%; (DeStatis 2019a)]. Age is a major risk factor for many health conditions, including dementia. Currently

⁶³ In Germany, it is often the case that no clear distinction is made between the terms "nursing" and "care".

there are around 1.7 million people living with dementia in Germany, the majority with Alzheimer's disease (AD). More than 300,000 new cases of AD occur every year. As a result of demographic changes, far more new cases of AD are occurring than deaths among those already affected. For this reason, the number of people suffering from dementia is constantly increasing (Deutsche Alzheimer Gesellschaft e. V. 2018).

Further, cultural, social and regional diversity is increasing. Around one in four inhabitants of Germany has a background of immigration⁶⁴. Immigrants face disproportionate demographic ageing (Zeman 2005: p. 23 in Klaus & Baykara-Krumme 2017). Although they are integrated well into social and family networks and are less likely to live alone, they are affected more often and earlier by health impairments. Access to care and support is also more difficult (Klaus & Baykara-Krumme 2017). There also is an imbalance between urban and rural areas. Villages in the surroundings of the major cities often prosper. Elsewhere, entire regions suffer massively from rural exodus, especially in the east. According to the EU definition, around 15.3 million people in Germany were at risk of poverty or social exclusion in 2018; 18.7% of the population (DeStatis 2019b). Poverty correlates with people's health status and risk of needing long-term care (Unger et al., 2015 in RKI 2017).

Major strategies to ensure quality of care

Overall, paid and unpaid care, is regulated by the law in many ways (in family law, social law, medical law, labour law, etc.). The importance of quality of care in general has increased considerably in the German system in recent years. Numerous changes have been initiated. These include federal laws to reform long-term care insurance as well as a modification of the assessment guidelines for long-term care, including a new definition of "in need of care". There are also new laws intended to improve the situation of family members who are caring for relatives or those who wish to care for relatives in the future, laws that are intended to change the nurse-patient-ratio, and more.

Most recently, three federal ministries have launched a Concerted Action on Nursing/Care. Five working groups have been set up within the framework of the Concerted Action to develop specific recommendations for action. They are intended to improve the working and training conditions for care staff in a tangible way. The recommendations provide for many improvements, including some within digitization, but without specific details such as financing. They are occasionally viewed critically. During the COVID-19 crisis, it is fair to say that the discussion about better payment and improved working conditions has intensified.

⁶⁴ The population with a background of immigration comprises people who moved to the territory of the Federal Republic of Germany after 1949, all people born in Germany but without German nationality, and all those born in Germany with at least one parent who moved to Germany or was born in Germany as a foreign national. Of all persons with a background of immigration, almost two thirds themselves immigrated to Germany and a third were born there (Bundeszentrale für politische Aufklärung (2018).

How the rights of people in need of help and care should be reflected in everyday life is summarized on a moral level in the German Care Charter. This has been drawn up by representatives from all areas of care and self-help (BMFSFJ & BMG 2019)⁶⁵. Individuals' rights are formally and legally protected by different laws, e.g. the Patient Rights Act, among others. Furthermore, professional associations, federations and interest groups of all kinds have published various position papers on their ideas of good care. Another paper reported on nurse/patient ratios, poor job images, insufficient qualifications, the decreasing willingness to provide informal care and other challenges (as summarized in Meißner 2018). It is generally agreed that good care is at risk. The care system in Germany is struggling, as are many care systems in Europe.

Germany's approach to technologies in care

There is a broad societal consensus that innovative technical solutions play an important role in shaping the future of care. Digitization is at the very top of the federal agenda, as clearly shown by the Federal Chancellor's New Year's speech in 2020. The Federal Government wants to shape digital change and make Germany fit for the digital age. The Digital Government Factsheet⁶⁶ presents a detailed overview of Germany's progress in this field. However, the Digital Economy and Society Index (Initiative D21 2020) shows that Germany still has some way to go. One key issue is incomplete broadband coverage.

Within the care sector, many political initiatives are geared towards digitization, including the following examples. Within care and technologies, a wide range of national research funding programmes have been initiated. From 2012 until 2022, ministries are providing around 100 million EUR for the future of digital care. Many new technologies in care are being developed. Furthermore, in 2019 the Health Innovation Hub of the Federal Ministry of Health initiated the first Healthcare Hackathon, during which many different digital solutions were developed⁶⁷. The freshly printed Eighth Government Report on Older People e.g. deals with "Older People and Digitalization". National institutes are increasingly focusing on the topic of care with technology. For example, the German Ethics Council has formulated a position paper on "Robotics for Good Care" (Deutscher Ethikrat 2020) and the Office of Technology Assessment at the German Bundestag prepared the TAB Work Report No. 177 on "Robotics and assistive neuro-technologies in care" (Kehl 2018). And, relevant for digital solutions in general, the recently founded ministerial Agency for Innovation in Cybersecurity was launched in June to ensure that Germany enjoys digital autonomy.

Finally, it should be mentioned that it is generally recognised that digital skills are lacking in the care sector. Some tenders therefore focus on this issue. At the same time, the transfer of digital competences in that sector is currently not systematically integrated into education. However, there are currently many kinds of initiatives trying to advance digitization in care.

⁶⁵ <https://www.wege-zur-pflege.de/pflege-charta.html>

⁶⁶ https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Government_Factsheets_Germany_2019.pdf

⁶⁷ <https://hih-2025.de/erster-healthcare-hackathon-ueberzeugt-mit-praxisnahen-loesungen-und-teilnehmerzahlen/>

It is thus important to find out what technologies contribute within ageing and care. Some examples are therefore presented below. For most technical products, there is a lack of evidence for their effectiveness, user-friendliness, or user acceptance. It must therefore be pointed out again that the description of the technical systems is only a snapshot and must be regarded as random, solely, descriptive and incomplete.

5.3.2 Contribution of technologies to care on specific issues

Contribution of technologies during the COVID-19 pandemic

The outbreak of the COVID-19 pandemic presents us all with new challenges. Unprecedented challenges must be overcome in everyday care. The implementation of digital innovation is to a certain extent driven by these special circumstances. For example, some residents in German nursing homes are experiencing the possibility of communicating with relatives via videotelephony for the first time. Or telepresence systems enable contactless interaction in hospitals. In view of the effects of the pandemic, technical innovations are currently being promoted to a particularly large extent. Many new innovations are emerging. In addition, we are seeing the benefits of digitization in times of social distance or regarding further containment of the pandemic, e.g. through a tracing app, even if opinions on the app differ. The implementation of technology will be further promoted by COVID-19. IT companies are providing video conferencing servers free of charge; neighbourhood help is booming and much more. There is an extraordinary amount of positive news in connection with the technological development. Business enterprises, science, trade associations and politics are trying to cope with the situation using their own resources.

Overall, the pandemic is a burden, both for those who need care and those who provide care, either formal or informal. In the future, many reports will be formulated, and research will be carried out on the pandemic and its effects. This report does not deal with these aspects. That would go beyond its scope.

What is certain is that technical innovations will sometimes be implemented during this period which would certainly not have been possible before COVID-19. At the same time, in this crisis, aspects previously perceived as less important now appear to be extremely important. These include the lack of broadband coverage, Wi-Fi and hardware among service providers, as well as the low level of digital competence among those in need of care, their relatives and professional carers. And no matter how much the pandemic may be stimulating technical innovations, it should not be forgotten that these are not currently undergoing any special tests regarding their quality or benefit. In this respect, reference can already be made to the summary, the conclusions of which are also of great interest under COVID-19.

Contribution of technologies to social isolation and loneliness

In their coalition agreement for the 19th legislation period starting on 12 March 2018, the coalition parties agreed to develop strategies and concepts to prevent and combat loneliness in all age groups

(Deutscher Bundestag, 2019: p. 118). Many devices have been developed with the aim of improving social isolation or loneliness. Three examples of technologies in use are given.

MEDIA4CARE SENIOR-TABLET

Media4Care⁶⁸ is a pre-installed tablet device with around 700 activity options. It was launched in 2013 and comprises almost 700 elements to promote physical, cognitive and psychosocial abilities. e.g. “Dalli-Klick” text puzzles, calculating, noise puzzles, or memory exercises. The tablet was developed by a Berlin start-up aimed at people with dementia. A summary of how to set up the senior tablet for the first time can be found, as well as a user manual and a table of contents. The page is password protected. The password is sent with the order confirmation email. The tablet includes an internet-enabled SIM card on request. Telephone support is available for questions, but remote maintenance is not possible. The company recommends that a relative should initially set it up, but it is aimed at individuals with or without dementia. Additionally, individual profiles with personal content can be created. There are two different devices. The senior tablet is for individual use of the person in need of care. The carer tablet is for institutional use. Additionally, the content can be transferred to a television set via an interface and thus be made available to groups. Depending on how long the subscription is, the monthly costs are between €30 and €40, including a full package of services. The company supports internships, jobs and students’ BA/MA theses. In 2019, the health insurance company IKK supported the tablet. The start-up has won several prizes with its tablet. It was developed by a team of personally affected relatives of senior citizens suffering from dementia, supported by experts from science and care, according to the company. It has yet not been tested in any trials. Today it is used in a few thousand care and nursing facilities in both Germany and Austria.

PEPPER – an interactive robotic system

For some time now, the Pepper⁶⁹ robotic system has been increasingly present in Germany on the internet, radio and television and at specialist congresses or trade fairs and is known to the public and not only in expert discourse. Pepper is a 1.20-m-tall humanoid robotic system launched by the company SoftBank Robotics in 2014. In various research projects, the robot has been renamed, for example “Zora” or “Emma”. Pepper has a camera in its forehead to support the recognition of faces and basic emotional human facial expressions. The system interacts with humans by speech or by touchscreen. It has 20 different options for motion sequences and facial expressions. The system can speak fifteen languages. It must be programmed individually to provide the desired interaction. This means that existing software packages must be purchased, or individual programming is necessary. The robotic system is currently undergoing intensive research within care in Germany, where it is being applied to support healthcare professionals and patients. The system is designed to be informative and communicative, for example, it plays Memory (a popular memory game in Germany), tells jokes, plays music and animates people to dance or shows movements that the residents can imitate. As yet, no meaningful findings on

⁶⁸ <https://www.media4care.de>

⁶⁹ <https://www.softbankrobotics.com/emea/en/pepper>

its effectiveness or about the attitude of nurses and patients are available. Within the care system, it cannot yet be used autonomously, meaning that it requires resources to set it up and maintain it. The hardware system costs around €17,000. It must be programmed individually, and similar costs are to be expected for the software. There is no overall cost overview, so care providers cannot clearly calculate direct and indirect costs. Additionally, further costs must be considered, e.g. for training, maintenance costs or electricity. Overall, the media presentation gave a false picture of the capabilities of the technical system in the complex field of care.

VRALIVE

The young start-up VirtuaLounge in Brunswick offers a place where people can have experiences in virtual reality (games, journeys etc.). It is aimed at young people, business clients (e.g. for team building) and older people (who join alone or with friends for some VR sessions or celebrate birthdays in the VR lounge). In a research project with the Technical University in Brunswick (Institutes for Psychology and Medical Marketing), the developers learned from carers that people in care institutions often lose their independence. They came up with the idea of revitalising residents in care institutions through interaction, experiences and new impressions in virtual worlds and trying to find out which virtual experiences are suitable for this purpose. The project VRalive⁷⁰ is a research project that deals specifically with health goals and effects on the older generation. It is a joint project by the Braunschweig start-up company VirtuaLounge together with Spielraum UG in cooperation with the Technical University in Braunschweig. So far, only trial events involving older people who are still mobile have taken place. However, these were very positively received by the participants. The start-up also offers workshops including setting up all the equipment in care institutions. The residents can use the VR glasses one after another while other residents follow on the screen. The start-up describes positive feedback by participants and carers in their workshops. The price for one hour in the VR lounge is €35 per person. It can be used by people who are independently mobile. In workshops in care institutions, one or more people can participate whatever their gender or financial background. They can either participate actively by using the VR glasses or passively by following on the screen. Technologically, these are digital 3D glasses that display a wide range of experiences such as an underwater world, a landscape, or a city. A virtual garden is planned. The new technique is intended to train and promote perception, attention, concentration, orientation, mobility and coordination. The research and development project started August 2020.

Contribution of technologies to mobility

ELECTRIC BICYCLES

Electric bicycles, or pedelecs, are becoming more and more popular. Whereas there were only around 1.6 million bicycles of this type in Germany in 2014, there were already 4.5 million in 2018. One negative aspect is that people who have an accident with a pedelec usually injure themselves more seriously than

⁷⁰ <https://www.virtualounge.de/fur-senioren/>

on a conventional bicycle. The risk of a fatal accident is also three times as high with a pedelec, as they are heavier, and their speed is often underestimated or cannot be controlled without practice. Of the pedelec riders killed in accidents between 2014 and 2018, 61% were seniors aged 75 and older. By contrast, they made up 33% of those killed in accidents involving non-motorized bicycles (Bundesministerium für Verkehr und digitale Infrastruktur, 2019). Occasionally, courses are offered for people to compensate for declining physical abilities or practise cycling in road traffic (Parth, 2019).

MOBISAAR

Mobisaar⁷¹ is a mobility platform for people with limited mobility. The platform can be used to request guides to assist mobility-impaired travellers. The app divides the process into 2 phases: a booking and a travelling phase. In the booking phase, the passenger requests a guide for a trip. The request can be posted via a mobile app, online or by telephoning the mobisaar call centre. The mobisaar back-end team sends out a request to possible mobility guides. A guide accepts the request and the passenger is informed. Accordingly, the guide meets with the passenger and makes sure that he/she is escorted according to his/her needs. The trip could be door-to-door or a request to help change from the tram to the bus at the main train station. After carrying out the service, the guide is free to take on the next request and the passenger can book another request. In urban regions, a response to a request may come within 20 minutes; in the countryside it is more likely to take 2 hours. It is a matter of number of requests and availability of guides. The app is used by passengers, guides and call centre agents, and is free of charge. Currently, it relies on public funding programmes to pay the guides. It is also a means of re-integrating unemployed people into the world of employment, as they can take part in the project on a “minimum employment” contract. Public transport operators are mostly interested in earning money, and the mobisaar system is perceived as a cost factor without paying off in the end. The service is currently taken up by around 500 users.

MEMORE

The Memore Box from Retro Brain R&D GmbH⁷² is a gesture-controlled game console developed in Germany that can be connected to a television set. The player is accompanied by the avatars Anna and Paul. They can be individually selected to act as the main actors in the games. It was developed especially for and with seniors and is certified as a medical product. A television with an HDMI connection is required and an internet connection is strongly recommended. A room with a playing radius of about 2–3m is required. The box is targeted at inpatient facilities, among other things. The game modules can be played individually and in a group, including mixed age groups. The modules include dancing, singing, table tennis, bowling, taking a weekend trip or being a postal worker. The product is currently being tested and evaluated in numerous care facilities. Currently, around 150 facilities in Germany are equipped with a memoreBox. The memoreBox is in use nationwide in facilities such as nursing homes, hospitals and multi-generational homes. Previous pilot projects and studies can be distinguished from

⁷¹ <https://www.mobisaar.de/>

⁷² <https://www.retrobrain.de/>

this market use: the Hospital zum Heiligen Geist in Hamburg and the Evangelische Johannisstift in Berlin (a Protestant social welfare foundation with various institutions) took part in the initial accompanying evaluation as part of a project by the Barmer health insurance company from 2016 to 2018. The current nationwide roll-out includes 100 care facilities throughout Germany. Normally, one facility is equipped with one memoreBox, which is available to senior citizens as one aspect of prevention and health promotion, as the company describes. No reliable data is yet available.

Contribution of technologies to Personal Hygiene

LAUNDRY SERVICE APP for outpatients

The company CosaVita⁷³ is a young start-up that offers an app featuring a standardized and digitally controlled laundry service for outpatients – like meals on wheels, but for laundry. The app was launched on the market by the start-up established by Caritas Geldern-Kevelaer. Caritas is a regionally organized welfare organisation run by the Catholic Church. The service carries out duties for roughly 140 outpatients. Nothing is known about the attitude of the nurses and outpatients towards the service. Since it is a start-up product, no research is available. However, the start-up won the SENovation Innovation Award (start-up category) of the Seniors' League and the Signal-Iduna Group for senior-friendly concepts in 2019⁷⁴. The service is paid for only by outpatients, with no additional cost for nurses. The app makes it easier for outpatients to do their daily laundry. The prices for an all-round laundry service are around €100 per month. The person in need of care can also book the service for individual items, e.g. heavy items such as large pieces of bed linen or bath sheets. This can be organised individually. In this case, however, the contact person for the consumer is not CosaVita, but their partner, the nursing service. This makes the logistics more difficult. The app is provided free of charge. The start-up company takes over the contracts with the laundry and organizes the logistics. At the same time, the nursing services receive the prepared data for invoicing. The processes are mapped completely electronically. The laundry to be washed is given a barcode and stored in a hygienically sealed laundry bag, which is taken by the nurses when they leave the house after care. The nurse scans the QR code on the bag with a mobile phone. At the care centre, the nurse unloads the bag into appropriate containers, which are collected by a logistics company and taken to the laundry. There the items are scanned again, cleaned and returned the same way (Grass, 2018, 2019).

BRINGLIESEL

BringLiesel⁷⁵ is a digital assistance system that delivers everyday necessities to those in need of care. In the online shop, users can choose from a range of over 500 products, from sweets and care products to cut flowers or erotic magazines. In times when sexuality is less and less of a taboo in old age, the latter are certainly relevant. Residential care facilities, outpatient care services and new forms of living such as

⁷³ <https://www.cosavita.de/>

⁷⁴ <https://www.senovation-award.de/finalisten-2019.html>

⁷⁵ <https://www.bringliesel.de/>

assisted living use this service. The product was launched in 2016. By registering free of charge in the online shop, care institutions can create a list of individual living quarters with the names of their clients. Nursing staff can make individual online shopping arrangements for each person in need of care. After the collected orders have been received, they are individually bagged with the names of the client and packed in boxes for each of the living quarters at the care facility or outpatient care service, etc. Sorting the shopping is no longer necessary and mistakes can almost be excluded. After two or three working days, the order is delivered and charged to the resident's or client's personal allowance account. The products in the online shop are at market prices, while registration is free of charge and not bound to contractual conditions. Together with those in need of care, caregivers select the products that the residents or clients want from a catalogue or an online shop via a tablet. The ordering interface was developed in cooperation with care teams. The order is delivered directly to the care facility in individual, opaque bags labelled with the person's name. Automatically generated individual invoices also ensure transparency and administration support. The company, which is based in Berlin and Lübeck, currently supplies around 1,000 care facilities throughout Germany.

Contribution of technologies to Nutrition Management

ONLINE DELIVERY SERVICE

Many supermarkets and commercial providers offer an online delivery service enabling goods to be ordered and brought to people's homes for an extra charge. The delivery costs vary greatly due to different calculation methods. In some cases, the costs of a shopping service, as a housing-related service, may be covered by a person's nursing care insurance. Nothing is known about user numbers, usability or cost-effectiveness.

Contribution of technologies to cognitive and communication skills

TOVERTAFEL

The Tovertafel⁷⁶ ("magic table") is developed and distributed by the Dutch company Active Cues. It has been available on the German market since 2017. The first Tovertafel was created for people with dementia as part of a dissertation project. The company focuses on the participative development of its products. The concept has been extended to include people with learning disabilities and children with autism. The latter is only available in the Netherlands. The product is a gaming solution that connects older people with moderate to severe dementia with each other and their environment and encourages them to exercise. The games can be played either independently or under supervision. A device with eight games costs around €6,000. In total, 16 games are available. With another eight games the Tovertafel costs about €10,000. The Tovertafel is attached to the ceiling above a table and can be removed and hung up again in another place. Included in the price are 4 ceiling mounts, so that a Tovertafel can be used in 4 areas. Technically it consists of a digital projector, infrared sensors, speakers and a processor

⁷⁶ <https://tovertafel.de/>

with which the games are projected onto the table. The projections react to hand and arm movements. The manufacturer carries out accompanying research that shows positive results. The Tovertafel is becoming increasingly present in the media. In Germany, there are about 250 such tables in use for both target groups. There is currently no reliable research on the impact or best ways to use them.

ICHÓ

Ichó is Greek and means echo. It is a digital, interactive therapy ball⁷⁷. It detects when it is shaken, caught, thrown, held, pressed or stroked and reacts with a coloured glow, vibration, sound and music. Ichó offers access to people with cognitive and motor disabilities through the interaction of different senses – sight, touch, sound – and low-threshold communication. The ball is equipped with 10 starter applications, which set different priorities, e.g. gaming, biography work or motor skills training. Additional applications are possible. Ichó aims to develop people's cognitive and motor skills in a playful way. Originally, ichó was developed for therapy for people with dementia. Since then, the applications have been expanded and can be used for children with autism or other neurodegenerative diseases, for example. The ball is also used for children who need support with concentration and learning difficulties, up to the most seriously ill children with what is known as childhood dementia. Ichó is also used for stroke patients, accident victims in rehabilitation or Parkinson's disease. Currently, ichó (ichó.care) is designed for professional use. The company is currently working on the recording of specific data, e.g. recording and documenting a user's tremor or automatically logging the intervention in the care documentation. The company offers webinars for care workers, free of charge during the COVID-19 crisis. The cost is around €1,200 net per ichó ball, ten standard applications included. It has been on the market since April 2020. 150 pre-orders were made through pilot projects for the prototype. No valid data are available on outcomes or acceptance. The company is currently working on a version for personal use (ichó.home).

Contribution of technologies to behavioural and psychological issues

PARO

PARO⁷⁸ is a 60-centimetre robotic baby seal developed at the end of the last century by the National Institute of Advanced Industrial Science and Technology in Japan. The robot is equipped with a tactile sensor enabling it to detect whether it is being held or stroked. It is programmed for human reactions and can express joy by wagging its tail, opening, or closing its eyes; or show satisfaction by, for example, responding with friendly, baby-like sounds. PARO has been researched for over two decades. This research suggests that PARO can promote positive emotions, trigger caring behaviour and increase social interaction (e.g. Klein et al., 2018; McGlynn, Kemple et al., 2017; Moyle et al., 2017; Robinson et al., 2015; Wada & Shibata, 2007). Personal experience also shows that PARO is also very well received by nursing staff. Most research carried out is not reliable, and in some research, it has been shown to

⁷⁷ <https://icho-systems.de/de/>

⁷⁸ <http://www.parorobots.com/>

have a negative impact (Soler et al., 2015). This is because it was mainly carried out with small case numbers, usually without a control group, over short periods of time and sometimes by the manufacturer or researchers close to the manufacturer. The only large-scale study, which was carried out some time ago, shows that PARO is no better than a soft toy. Rather, the study only shows that the use of a medium, i.e. an object, is more helpful than not using any medium at all, because it stimulates interaction (Moyle, Jones et al., 2017). Assuming that the effect is based on people's reaction to childlike characteristics, this is logical. However, this reflex is not specific to dementia and raises the question of whether the use of such an item infantilizes people who have dementia, which goes against the principles of person-centred care. The fact should be considered that positive effects are also known from animal-assisted therapy. Any medium, whether it is an animal, cuddly soft toy or cute robot, nevertheless has its peculiarities. The costs incurred are not limited to the purchase price but include direct costs (purchase price of €6,000), indirect costs (maintenance, training, updates) and hidden costs (electricity). PARO is cute but at the same time the most expensive medium at present. PARO is currently being used in around 100 nursing homes in Germany.

TELEMEDICAL SERVICES

The use of technical systems to deal with behavioural and psychological issues is far from common. This may become a problem during the COVID-19 pandemic. The spread of the pandemic and all related regulations and practices adopted by mental healthcare providers, as well as current distancing and contact rules, are changing the lives and needs of people with mental illness. Outpatient psychiatric care mainly works on an outreach basis and usually cares for patients during crises and/or with significant behavioural and psychological issues. Currently, many patients are afraid to open their door or do not make use of outpatient services. Many domestic situations do not allow general hygiene and distancing rules to be observed; some (severely impaired) patients are not able to comply with the protective measures due to illness and belonging to the high-risk group. Currently, it is necessary to enquire with every health insurance company whether and under what conditions telemedical services are possible through outpatient psychiatric care. The health insurance companies react in various ways. Psychotherapists, on the other hand, can now offer telephone and video appointments without any problems during the pandemic (BAPP et al., 2020).

Contribution of technologies to personal safety and security

EMERGENCY CALL SYSTEMS

See below

Contribution of technologies to high-need care for high dependence

JACO – a robot gripper arm

The KINOVA JACO® robot arm gripper from the Canadian company Kinova is a robotic arm for people with limited mobility of the upper extremities, e.g. tetraplegics, multiple sclerosis patients or people with cerebral palsy. It is a gripper arm with three fingers that can extend or replace reduced or non-existent

hand functions. The robot arm is mounted on the side of the wheelchair and uses the same power source as the wheelchair. It is controlled via an existing operating element, which can be a joystick, head control or other control variant depending on the individual situation. It weighs about 5 kg and has a load capacity of 1.6 kg and a reach of 90 cm⁷⁹. It is certified as a medical device and has a CE marking. It has been on the market in Germany for a few years, but nothing is known about the number of users. There is also no valid information about its benefits or acceptance.

MOBIPAR

The BMBF-funded research project MobIPaR⁸⁰, for the mobilisation of people in need of intensive care by adaptive robotics, is a joint project. That project brings together clinics, universities and a robotics company to develop and research into a vertically adjustable robot-assisted care and rehabilitation device to mobilise people in need of intensive care: VEMO® (robot-assisted Very Early Mobilization). The aim of the MobIPaR project is to investigate the clinical applicability of a vertically adjustable care and rehabilitation device in intensive care units for mobilisation. The device is aimed at inpatients and carers in intensive care. The project ended in 2020 and findings have not yet been published. Patients with neurological disorders are provided with robotically optimized, auto-adaptive therapy to promote their recovery and relieve the burden on the carers. Based on a patent application and the expertise gathered on development standards for medical devices, an existing concept is being further developed involving modular components to be attached to the bed and Assist-as-Needed functionalities.

Contribution of technologies to life and care planning in the context of uncertainty

Emergency information and News App NINA

NINA⁸¹ is an app for smartphones made available by the German Federal Office for Civil Protection and Disaster Assistance (BBK), which is used to send important or urgent warnings to the population. With the dashboard, it is possible to select places and areas for which warnings are to be received. The detailed view provides further information, e.g. a map view of the area in question, a colour-coded warning level, or recommendations for action. The app also provides “emergency tips” on how to protect and prepare yourself and others in emergency situations. All residents are affected, and older people cannot be excluded. Information on the app or operating instructions are available in simple German and sign language.

EMERGENCY CALL SYSTEMS

So-called home emergency call systems are widely used. There are various kinds of emergency call systems, e.g. house-emergency-systems with a transponder or emergency systems independent of location (arm strap or wristband). In an emergency, they inform a neighbour, close relatives or the nursing or rescue service automatically or at the push of a button, sending out an alarm and locating the

⁷⁹ <https://www.kinovarobotics.com/de/produkte/assistive-technologien/kinova-jaco-roboterarm>

⁸⁰ <https://www.mobipar-projekt.de/>

⁸¹ https://www.bbk.bund.de/DE/NINA/Funktionen/Funktionen_node.html

wearer by means of an emergency call bracelet or the emergency call button on the smartphone, offered by different providers. If an emergency call is received, the staff member at the control centre initially attempts to clarify the situation. If necessary, he or she will then inform a relative, the nursing service, the police, or the fire department directly. Related services are mainly offered by welfare organisations. There are a wide variety of systems on the market from different suppliers at different prices and with different possibilities. Precise user statistics etc. are not recorded centrally and are therefore not known.

Contribution of technologies to accessing care of any type

MITPFLEGELEBEN.DE

The company mitunsleben GmbH (“live with us”), with its headquarters in Berlin, is the largest ecumenical start-up in Germany. The goal of mitunsleben GmbH is to develop digital solutions and platforms for the care sector. Founded in November 2018, the young, public-welfare-oriented company developed the care platform mitpflegeleben.de⁸². Mitpflegeleben.de (live with care) is a service platform for questions about care. It is supported by 16 non-profit organisations. The platform provides information, checklists and advice on care-related topics, puts those affected in touch with providers in the region, lists aids, compares costs and leads users directly to the providers’ websites. Nothing is currently known about the number of users.

NEBENAN.DE

nebenan.de⁸³ is a digital platform for offering and receiving support in local neighbourhoods – a digital marketplace for physical solidarity, a bulletin board with offers and requests, a community network for all kinds of services and demands in daily life. nebenan.de was founded in 2015. It is a portal where people with a need for help/assistance, volunteers, and organizations (non-profit associations, social institutions and municipal institutions) can register and actively seek neighbourhood assistance/involvement and work actively on district/urban development. It is Germany’s biggest social network for neighbours. The digital platform is used to match needs with offers that are physically close to the user’s place of residence. The platform offers 4 categories: posts (networking, communication), marketplace (buying, selling, sharing, giving things away), events (getting to know each other, inviting people to meet) and groups (for special interests, open and private) so that demands, offers and ideas can be structured. It enables direct communication with residents and initiatives. Apps for mobile devices are available. The portal is supported by several partner institutions: Diakonie Germany, in the city of Hanover (the department for seniors supports age-appropriate district development), Bundesarbeitsgemeinschaft Seniorenbüros (offices supporting volunteering by older people) or Deutscher Städtetag (the Association of German Cities). The platform is aimed at anybody who wants to participate in neighbourhood schemes and networking, and networking especially volunteers and organizations offering to support people and the common good in their local environment. 1.6 million

⁸² <https://mitpflegeleben.de/>

⁸³ www.nebenan.de/

users and 18,000 active neighbourhoods are registered (04/2020). The platform has received awards (Top 50 Social Innovators to Watch, the managing director was also named Best Founder at the German Start-Up Award in 2020). A neighbourhood is defined by a name and borders: the platform offers lists (and maps) with local active neighbourhoods showing the categories of offers and interests, as well as the number of participants. It also contains a public marketplace for classified ads (furniture sales etc.). Due to the variety of possibilities, it can help single people stay living in their own homes for longer and get things done by neighbours which they can no longer do on their own. Furthermore, social contacts can arise from the platform via social meetings or talks – this helps them find people to meet the needs of their individual social life (e.g. playing cards). The platform can be accessed by anyone who uses the Internet and is certified by the German technical inspection agency (TÜV). The platform enables people to network with others in the region and provides communication, help, support and requests for many services and things in daily life (e.g. purchases, social interaction, babysitting, finding flats, sharing food, sharing gardens or selling furniture). Users can decide whether their message should be displayed within a radius of 10 minutes on foot (standard) or whether it should be distributed to the surrounding area.

GIG WORK PLATFORMS

New digital platforms are being established in care, similar to Airbnb for tourism or Uber for transport. These digital job markets are changing the care sector. The platform fulfils the role of a middleman. This brings with it various pros and cons depending on the interests involved; these have already been prominently discussed, for example, in relation to Uber, and will not be re-examined in any further detail here. With digital platforms, a distinction is made between the peer-to-peer (P2P), business-to-consumer (B2C) and business-to-business (B2B) business models. Nursing or care activities are provided via peer-to-peer (P2P) platforms. They are always location-dependent and thus count as “gig work” or the gig economy (Hegedüs et al. in Press). Various companies are active in this field, e.g. GigWork.de⁸⁴ or careship.de⁸⁵. The market is fast-moving. New platforms appear, disappear again or are taken over by larger ones. User numbers are not known. The discussion about such platforms is increasing. They are expected to transform care.

Contribution of technologies to carer skills

ONLINE COURSES OF VARIOUS KINDS

Family carers sometimes do not have the time to regularly attend a nursing course locally. Online courses are offered by various providers. Especially since the COVID-19 crisis, online training and further education of various kinds is increasingly being offered also for formal caregivers.

⁸⁴ <https://www.gigwork.de/>

⁸⁵ <https://www.careship.de/>

Digital literacy

“DIGITIZATION AND EDUCATION FOR OLDER PEOPLE” SERVICE POINT

In 2017, the Federal Association of Senior Citizens’ Organisations (Bundesarbeitsgemeinschaft der Senioren-Organisationen e.V. | BAGSO) set up the nationwide “Digitization and Education for Older People” service centre under the guidance of the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth. The service centre functions as a nationwide network centre with a platform for activities, advice and information in the form of an online portal (www.wissensdurstig.de). Furthermore, it offers information brochures (e.g. “signposts”) for senior citizens with basic information on the main topics of digitization and education. In addition, the website offers training courses for multipliers on the topic of “(digital) education in and for old age”. The service point also promotes flagship projects in the thematic areas throughout Germany, including those for hard-to-reach target groups and rural areas. The aim of the service point is to further educate older people in the context of digitization, promoting their participation and self-determination in old age by improving their digital skills. However, nothing is known about the number of users. There is also no valid information about the benefits or acceptance.

Contribution of technologies to give voice to recipients of care

SOCIAL MEDIA | WHATSAPP® MESSENGER

Currently, a total of 3.48 billion people worldwide use social media. In Germany, the messenger service WhatsApp® is by far the most widespread, followed by Facebook Messenger and Google (BITKOM, 2018). The use of WhatsApp® has increased in all age groups. Most users are still 14- to 29-year-olds (87% of whom use the app). With increasing age, usage decreases: 29% of people in the 65+ age group use the app (Initiative D21 2020). Mobile internet use is increasing overall, including among the older generation (Initiative D21 2018). The overall trend is rising.

5.3.3 Summary

The aim of this section is to discuss how the technologies are in accordance with relevant national frameworks. In Germany, as elsewhere, technologies are developed based both on technical possibilities (technology push) and application needs (demand pull). Technical possibilities are often developed within the framework of funding, partly because calls for proposals focus on technologies, e.g. robotic systems for care or robots for assistance functions or innovation in higher education through artificial intelligence and Big Data. Needs-based applications often result from experience in a very personal context. As can be seen in the selected examples, some technologies contribute to specific care issues and others do not. In summary, the product range vary widely. This is positive by one hand: Different needs in different areas are addressed by different technologies. By the other hand: Who is able to overlook these impressive possibilities? Who is able to make decisions in this fast-changing field, and bearing in mind that the care situation is also fast evolving? Also, the financing is often not clear or even the price is not known. Another aspect is, that some products terminate when research funding ends.

Also, some aspects, e.g. cultural diversity is not taken into account within reported technologies. Many questions arose. Altogether, for Germany the “bigger picture” is not clearly transparent. The close link between digital strategies, ageing and care frameworks and technologies and the coherence between them could not be identified. Many technologies may support care and a good later life, but the targeted social change and the “bigger picture” cannot clearly be seen while looking at all those technologies.

5.3.4 References

- BAPP, DFPP, DVGP (2020). Ambulante psychiatrische Pflege während der COVID-19-Pandemie gewährleisten. https://www.bapp.info/archiv/corona/Corona-Brandbrief_BAPP-DFPP-DVGP_final.pdf
- BITKOM (2018). Neun von zehn Internetnutzern verwenden Messenger. <https://www.bitkom.org/Presse/Presseinformation/Neun-von-zehn-Internetnutzern-verwenden-Messenger.html#:~:text=Berlin%2C%202002.,WhatsApp%2C%20Facebook%20Messenger%20oder%20iMessage>
- BMFSFJ, & BMG (2019). Charta der Rechte hilfe- und pflegebedürftiger Menschen. 13. Aufl. (3BR06). <https://www.bmfsfj.de/blob/93450/534bd1b2e04282ca14bb725d684bdf20/charta-der-rechte-hilfe-und-pflegebeduerftiger-menschen-data.pdf>
- Bundesministerium für Verkehr und digitale Infrastruktur (2019). Runter vom Gas – Eine Verkehrssicherheitskampagne von DVR und BMVI. Unfälle von Senioren im Straßenverkehr. <https://www.runtervomgas.de/verkehrsteilnehmer/artikel/unfaelle-von-senioren-im-strassenverkehr.html>
- Bundeszentrale für politische Aufklärung (2018). Bevölkerung mit Migrationshintergrund I. In absoluten Zahlen, Anteile an der Gesamtbevölkerung in Prozent, 2018. <https://www.bpb.de/nachschlagen/zahlen-und-fakten/soziale-situation-in-deutschland/61646/migrationshintergrund-i>
- DeStatis (2018). Pflegestatistik 2017. Pflege im Rahmen der Pflegeversicherung Ländervergleich - Pflegebedürftige. https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Gesundheit/Pflege/Publicationen/Downloads-Pflege/laender-pflegebeduerftige-5224002179004.pdf?__blob=publicationFile
- DeStatis (2019a). Ältere Menschen. Die Bevölkerungsgruppe der älteren Menschen ab 65 Jahren. <https://www.destatis.de/DE/Themen/Querschnitt/Demografischer-Wandel/Aeltere-Menschen/bevoelkerung-ab-65-j.html>
- DeStatis (2019b). Anteil der von Armut und sozialer Ausgrenzung bedrohten Menschen in Deutschland stabil. Hg. v. Statistisches Bundesamt. https://www.destatis.de/DE/Presse/Pressemitteilungen/2019/10/PD19_419_639.html
- DeStatis (2019c). Bevölkerungsstand. Ergebnisse der Bevölkerungsfortschreibung auf Grundlage des Zensus 2011. Statistisches Bundesamt. <https://www.destatis.de/DE/Themen/Gesellschaft->

Umwelt/Bevoelkerung/Bevoelkerungsstand/Tabellen/zensus-geschlecht-staatsangehoerigkeit-2019.html

- Deutsche Alzheimer Gesellschaft e. V. (2018). Die Häufigkeit von Demenzerkrankungen. Informationsblatt 1. http://www.deutsche-alzheimer.de/fileadmin/alz/pdf/factsheets/infoblatt1_haeufigkeit_demenzerkrankungen_dalzg.pdf
- Deutscher Bundestag (2019). Drucksache 19/10456. Antwort der Bundesregierung auf die Kleine Anfrage der Abgeordneten Dr. Andrew Ullmann, Michael Theurer, Renata Alt, weiterer Abgeordneter und der Fraktion der FDP – Drucksache 19/9880 –. 19. Wahlperiode. <http://dip21.bundestag.de/dip21/btd/19/104/1910456.pdf>
- Deutscher Ethikrat (2020). Robotik für gute Pflege. <https://www.ethikrat.org/fileadmin/Publikationen/Stellungnahmen/deutsch/stellungnahme-robotik-fuer-gute-pflege.pdf>
- Grass, Michael (2018). Dienstleister mit App für die Pflege. In RP Online, 17.10.2018. https://rp-online.de/nrw/staedte/kleve/kleve-hsrw-professor-entwickelt-app-fuer-pflegedienst_aid-33728309
- Grass, Michael (2019). Wäsche Start-Up startet durch. In RP Online, 01.10.2019. https://rp-online.de/nrw/staedte/kleve/hochschule-rhein-waal-waesche-start-up-von-frank-schmitz-startet-durch_aid-45839559
- Hegedüs, A., Nonnenmacher, L., Kunze, C., & Otto, U. (in Press). Digitale Vermittlungsplattformen in Pflege und Betreuung. In A. Meißner und C. Kunze (Hg.), *Neue Technologien in der Pflege*. Kohlhammer.
- Heger, D., Augurzky, B., Kolodziej, I., Krolop, S., & Wuckel, C. (2017). *Pflegeheim Rating Report 2017*. medhochzwei.
- Initiative D21 (2018) D21-DIGITAL-INDEX 2018/2019. https://initiated21.de/app/uploads/2019/01/d21_index2018_2019.pdf
- Initiative D21 (2020). D21-DIGITAL-INDEX 2019/2020. https://initiated21.de/app/uploads/2020/02/d21_index2019_2020.pdf
- Kehl, C. (2018). Robotik und assistive Neurotechnologien in der Pflege - gesellschaftliche Herausforderungen. TAB-Arbeitsbericht Nr. 177. Hg. v. Büro für Technikfolgenabschätzung beim Deutschen Bundestag. <https://www.tab-beim-bundestag.de/de/pdf/publikationen/berichte/TAB-Arbeitsbericht-ab177.pdf>
- Klaus, D.; Baykara-Krumme, H. (2017). Die Lebenssituationen von Personen in der zweiten Lebenshälfte mit und ohne Migrationshintergrund. In K. Mahne, C. Tesch-Römer, Julia K. Wolff und J. Simonson (Hg.), *Altern im Wandel: Zwei Jahrzehnte Deutscher Alterssurvey (DEAS)*. Springer, S. 359–379.
- Klein, B., Graf, B., Schlömer, I. F., Roßberg, H., Röhrich, K., & Baumgarten, S. (2018). *Robotik in der Gesundheitswirtschaft: Einsatzfelder und Potenziale* (1. ed.). medhochzwei.

- McGlynn, S. A., Kemple, S., Mitzner, T. L., King, C.-H. A., & Rogers, W. A. (2017). Understanding the Potential of PARO for Healthy Older Adults. *International Journal of Human-Computer Studies*, 100, 33–47. <https://doi.org/10.1016/j.ijhcs.2016.12.004>
- 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.
- Moyle, W., Bramble, M., Jones, C. J., & Murfield, J. E. (2017). "She Had a Smile on Her Face as Wide as the Great Australian Bite": A Qualitative Examination of Family Perceptions of a Therapeutic Robot and a Plush Toy. *The Gerontologist*. Advance online publication. <https://doi.org/10.1093/geront/gnx180>
- Parth, C. (2019). Ein Pedelec ist wie ein Geschoss. In *DIE ZEIT*, 20.07.2019 (ZEIT Online). <https://www.zeit.de/mobilitaet/2019-07/pedelegs-e-bikes-sicherheitstraining-senioren-mobilitaet>
- Rada (2016). Pflegekräftemigration aus den neuen EU-Mitgliedstaaten nach Deutschland: Entwicklungslinien, Zukunftsperspektive und verantwortliche Faktoren. <https://www.beobachtungsstelle-gesellschaftspolitik.de/f/8c5df6b57c.pdf>
- Robert-Koch-Institut (RKI) (2017). Gesundheitsberichtserstattung des Bundes. Gesundheitliche Ungleichheit in verschiedenen Lebensphasen. https://www.rki.de/DE/Content/Gesundheitsmonitoring/Gesundheitsberichterstattung/GBEDownloadsB/gesundheitliche_ungleichheit_lebensphasen.pdf?__blob=publicationFile
- Robinson, H., Macdonald, B., Kerse, N., & Broadbent, E. (2013). The psychosocial effects of a companion robot: A randomized controlled trial. *Journal of the American Medical Directors Association*, 14(9), 661–667. <https://doi.org/10.1016/j.jamda.2013.02.007>
- Soler, M., Agüera-Ortiz, L., Olazarán Rodríguez, J., Mendoza Rebolledo, C., Pérez Muñoz, A., & Rodríguez Pérez, I., Osa Ruiz, E., Barrios Sánchez, A., Herrero Cano, V., Carrasco Chillón, L., Felipe Ruiz, S., López Alvarez, J., León Salas, B., Cañas Plaza, J., Martín Rico, F., Abella Dago, G., Martínez Martín, P. (2015). Social robots in advanced dementia. In: *Frontiers in aging neuroscience* 7, S. 133. <https://doi.org/10.3389/fnagi.2015.00133>
- Wada, K., & Shibata, T. (2007). Living With Seal Robots—Its Sociopsychological and Physiological Influences on the Elderly at a Care House. *IEEE Transactions on Robotics*. (5), 972–980. <https://doi.org/10.1109/TRO.2007.906261>

5.4 National report: Netherlands

Louis Neven, Hein van Hout, Franka Meiland, Maartje Vermeer

5.4.1 A brief introduction to care in the Netherlands

The philosophy underpinning the Dutch healthcare system is based on several more or less universal principles: access to care for all, solidarity through medical insurance (which is compulsory for all basic care and available to all; additional insurance is available on voluntary basis) and high-quality healthcare services. The Netherlands spends about 12% of their annual gross national product on health care. This is relatively high compared to other European countries. Health and social care is financed through three separate compartments with many independent executive bodies: (i) preventive and community care (executed by the 355 municipalities), (ii) health care (executed by 10 insurers), and (iii) long term care (executed by 5 state/insurer combinations).

The 17.4 million inhabitants of the Netherlands live with 416 persons per square kilometre, which makes it one of the most densely populated countries in the world. In 2018, 18% was 65 years or older, and 4% 80 years or older. The life expectancy of persons who reach the age of 65 is 20 years of which almost 18 years in good mental health, 10 years without activity limitations, and 4 years without chronic diseases.⁸⁶ 12% of persons over 65 years used specific elderly care services in 2017.⁸⁷ Over 115,000 mainly very old persons reside in long term care facilities,⁸⁸ about half because of psychogeriatric conditions such as dementia. About 455,000 older persons receive home health aide or nurse care at home care during on average 4.5 months and 5.2 hours a week.⁸⁹

The major strategies to ensure quality of care

The Ministry of Health, Welfare and Sport wants people to be able to trust that healthcare is and will remain good, affordable and available.⁹⁰ Good care supposed to achieve care that is: (i) safe; (ii) effective (good result) and efficient (not too expensive); (iii) client-oriented: you receive the care at the right time, the right place and the care matches what you need; (iv) available to anyone who needs it; and (v) healthcare providers should know and respect clients' rights and treat clients with respect.

Several regulating bodies assure 'good care' is being facilitated, financed, and provided. (i) *The Netherlands Care Institute* (ZIN)⁹¹ is responsible for composing the basic package of insured care and

⁸⁶ <https://www.cbs.nl/nl-nl/cijfers/detail/71950ned>

⁸⁷ <https://www.vektis.nl/actueel/88-van-de-ouderen-gebruikt-geen-specifieke-ouderenzorg>

⁸⁸ <https://opendata.cbs.nl/#/CBS/nl/dataset/84529NED/table?dl=2CAFA>

⁸⁹ <https://www.vektis.nl/actueel/factsheet-ouderenzorg>

⁹⁰ <https://www.government.nl/ministries/ministry-of-health-welfare-and-sport>

⁹¹ <https://english.zorginstituutnederland.nl/>

sets quality standards. (ii) *Ten Health insurers*⁹² contract and compensate health care providers, services and products. Their shared ambition is to contract sustainable effective and efficient person-centred care, delivered with compassion, and to organize care in an innovative and smart way.

(iii) *The inspectorate of healthcare (IGJ)*⁹³ is part of the Ministry of Health and their ambition is that people in the Netherlands can rely on good health care for everyone, always and everywhere, also for future generations. They watch over healthcare in the Netherlands and the international market for medications and medical devices, act in the public interest and strive for effective supervision.

In the current cabinet's budget planning,⁹⁴ substantial attention is paid to the long-term consequences of ageing on future budgets. A preferred way to anticipate on this is through innovations and uptake of promising technologies (cf. Neven & Peine, 2017). The uptake of technology in health care is stimulated for example by showcasing good examples⁹⁵ and uptake incentives⁹⁶.

The Dutch approach to technologies in care

Promising innovations are showcased by national knowledge and dissemination centres Vilans⁹⁷ for long term care and Movisie⁹⁸ for welfare and social care.⁹⁹ Despite these knowledge centres, upscaling of promising technologies remains hard and uptake tends to be slow. Governmental leadership seems necessary for change. For example, improvement of access of patients to their electronic medical files started to scale up only after a passing a law to make this a legal requirement. Another difficult challenge is to improve information sharing across professionals to improve safety and reduce redundancy of testing and history taking. During the COVID-19 crisis, an emergency law passed, which allowed an opt out approach (instead of opt in) to share medication overviews and basic medical information across care settings.

Another barrier concerns the financial fragmentation into three separate compartments with many independent executive bodies. This hinders collaboration and uptake of promising initiatives. For example, financial incentives for preventive care are not working well if preventive activities have to be financed mainly by municipalities while benefits are seen in health care and long-term care (e.g. fewer and postponed admissions). Also, while one municipality may finance one technology, the other may choose to finance another. In addition, specialised professionals are mainly remunerated by patient related services rather than for population focused activities that may have preventative impact. Access

⁹² <https://www.zn.nl/about-zn>

⁹³ <https://english.igj.nl/about-us>

⁹⁴ XVI Volksgezondheid, Welzijn en Sport Rijksbegroting 2020 (XVI Public Health, Welfare and Sport National Budget 2020)

⁹⁵ <https://www.zorgvannu.nl/oplossingen/zorgthema/zorgthema/techniek-in-de-thuiszorg>

⁹⁶ <https://www.zonmw.nl/nl/onderzoek-resultaten/life-sciences-health/stimuleringsregeling-e-health-thuis-set/subsidie-aanvragen/>

⁹⁷ <https://www.vilans.nl/>

⁹⁸ <https://www.vilans.nl/>

⁹⁹ Other relevant websites are <https://thuisleefgids.nl/> and <https://www.zorgvannu.nl/>.

to specialised care requires referral of a general practitioner as well as an out of pocket contribution which can cost up to €380 per person per year. Other recorded barriers for uptake are a lack of vision and leadership within organisations, limited time and knowledge of professionals, and sometimes rudimentary infrastructures for internet connectivity (Jester Strategy, 2019).

After giving a short insight into the way good care is seen and organised in the Netherlands we will turn to the Dutch use of technologies in the care for older people. Before that we will give a brief impression of the use of care technology during the current corona crisis.

5.4.2 Contribution of technologies to care on specific issues

Contribution of technologies during the COVID-19 pandemic

The Netherlands were severely hit by the outbreak of COVID-19. Around the start of September, the national bureau for statistics estimated that more than 9000 people lost their lives as a result of this disease, with older people being the most affected group.¹⁰⁰ The Dutch healthcare system was severely stretched with COVID-19 patients in intensive care units peaking at just over 1400 around the start of April 2020.¹⁰¹ Most prominent measures included closure of schools, closure of bars, restaurants etc., working from home if at all possible, avoiding rush hour traffic, maintaining 1,5 meter distance, avoiding bodily contact, no visitors to care homes, and self-isolation in case of symptoms.¹⁰² After the peak in early April 2020 infections came down and testing was further ramped up. At the time of writing – September 2020 – a new spike of infections led to the implementation of new measures.¹⁰³

As part of this report interviews were held with a number of Dutch experts in the field of care technology (for more information see section 3). One of the areas these experts gave their opinions on was the use of (care) technology during the height of the Dutch COVID-19 outbreak in March and April 2020. The experts reported more eHealth use and more use of digital technologies by older people in general (e.g. shopping, online contact with loved-ones). All people, older people included, felt the need to do so. The experts mentioned that contrary to popular belief, older people do often have a degree of digital skills, and the vast majority of Dutch older people do have access to the internet. The experts saw that older people are currently more willing to try new technologies given the outbreak of the corona virus. Whether this will lead to permanent changes is a matter of debate, with some experts being more positive than others. Some believe that much will return to normal after the pandemic as financial structures incentivise this. Most experts do not expect a major effect of COVID-19 in the post-pandemic world. However, tech savviness of older people and willingness to try new technologies may improve. There are worries about the suitability of these technologies for all older people and whether they will increase

¹⁰⁰ <https://www.cbs.nl/nl-nl/nieuws/2020/22/sterfte-in-coronatijd>

¹⁰¹ <https://www.rivm.nl/coronavirus-covid-19/grafieken>

¹⁰² <https://www.rivm.nl/coronavirus-covid-19>

¹⁰³ <https://www.rivm.nl/coronavirus-covid-19/grafieken>

existing inequalities. The most useful technologies during the COVID-19 outbreak have been simple off the shelf technologies (e.g. WhatsApp®, Zoom®) that older people have found new uses for. The experts consider studying these technologies and their usage as important.

Contribution of technologies to care on specific issues

The following section gives a description of 19 technologies that are used in care in the Netherlands, although there are obviously many more technologies used in the care for older people or by older people in the Netherlands. This list of 19 technologies is not meant to be an exhaustive list. However, together the technologies listed below give an impression of what kind of technologies for older people are being used in the Netherlands. This list has been compiled making use of the knowledge the four authors have of care technologies in the Netherlands. In particular this study makes use of the experience of two of the authors (LN, MV)¹⁰⁴ in developing and running the GET-Lab¹⁰⁵. Established in 2015, the Gezondheid en Technologie Lab (health and technology lab) is a teaching facility at Avans University of Applied Sciences in which students and professionals in the area of health, wellbeing and technology are taught to use care technologies and reflect critically on the merits, drawbacks and ethical considerations of care technologies. The GET-Lab aims to maintain a full range of care technologies for older people relevant to and available in the Dutch context. This report thus draws on this expertise and adds to that the experience of two members (HvH, FM)¹⁰⁶ both affiliated with the Amsterdam University Medical Centre bringing in their insights from primary care geriatrics, integrated care and the role of technology therein.

Please note that the list below is only meant to give a short and basic impression of technologies used for or by older people in the Netherlands. With every technology far more research could be done, and many more sources could be found. The information provided below thus only provides a first impression for the purposes of this report, drafted within the time constraints of a fast-track procedure, and it is not to be seen as an academic publication.

Please also note that we have only selected technologies that are in use at some scale. While it would have been possible to list care technologies for older people that have failed – indeed failure is very common when technologies for older people are developed, the vast majority of technologies under development never make it to market (see interviews with experts below) – we have opted to list technologies that are successful in the sense that they are used frequently and less successful if used less frequently. This is also why some categories of technologies mentioned in other chapters are not mentioned here as we feel these technologies are less relevant and less used in the Dutch context. Please also note that quite a few of the technologies listed below are either aimed at people with dementia or

¹⁰⁴ Louis Neven, Maartje Vermeer

¹⁰⁵ See <https://www.avans.nl/onderzoek/projecten/detail/get-lab/introductie> for more information about the GET-Lab.
Go to <https://tourmake.it/getlab> for a virtual tour of the GET-Lab.

¹⁰⁶ Hein van Hout, Franka Meiland

can be used both by people who do or do not suffer from dementia. This reflects the importance of dementia care and the importance of technological innovation for people with dementia in the Netherlands.

Personal safety, security and mobility

SENSARA – safety monitoring

The Sensara system consists of movement sensors and a receiver that work via internet. (This section is based on: Meiland et al. (2014) and Hattink et al. (2016), the Sensara website¹⁰⁷ and the Sensara entry in *Thuisleefgids.nl*¹⁰⁸). The monitored data are shown in an app on a smartphone or tablet. A bed sensor can be added when needed. Daily movement patterns in the house (and leaving the house) are assessed and minor or serious deviations from the pattern are noted after which an alarm can be sent to family and/or professional caregivers. There are different versions available with different functionalities and for community or intramural usage. Sensara is on the market since 2014. Already in 2002, TNO¹⁰⁹ started with research into this sensor-based support. Also, in a European research project (Rosetta) parts of the predecessors of Sensara were tested and evaluated. The system can be used for vulnerable older people, mainly people with dementia, but also with other vulnerabilities. And it can be used both for community-dwelling older people who live alone and for those living in intramural settings. There are now over 5,000 users in the Netherlands, Europe and the US (355 users). Users are family caregivers and care organisations. People with dementia may feel it is a threat to their privacy. However, research showed (e.g. Hattink et al., 2016) that people are willing to give up some privacy in order to remain longer in their own home. People with dementia and/or family can decide with whom they share the monitoring data. Sensara can help detect various conditions at an early stage, e.g. malnutrition, bladder infection, day-night reversal and fall incidents. It gives people with dementia who are living alone an increased level of safety, just like people who co-reside with a partner. Family caregivers feel reassured when they are able to see the daily movement pattern of their loved one and they feel more in control. They access the app as often as they wish, and some do this several times a day. For others it may also be a burden to view their relative's behaviour regularly, so they may need support in how to use this in a suitable manner. In intramural settings the use of Sensara leads to fewer alarms and fall incidents, and fewer rounds are needed by nurses (and thus residents may experience a quieter night). The equipment is (partly) reimbursed by some health care insurance companies, and sometimes municipalities provide additional funding. There is variation in the price which may lead to inequality. There is probably a lower threshold for use in people who can afford the equipment, who are open to use technology and have a smartphone and internet. Some care organisations offer this equipment for their ambulant care clients (care at home). In residential care settings, people can be monitored in a way that suits their

¹⁰⁷ <https://www.sensara.eu/>

¹⁰⁸ <https://thuisleefgids.nl/product/wonen/domotica/bewegingssensoren-en-mechanische-schakelaars/my-sensara-slim-systeem/>

¹⁰⁹ <https://www.tno.nl/nl/>

needs. Strengths of Sensara are that the equipment is easily installed, support is available and there is a substantial amount of experiences with the system. Weaknesses are that it is mainly usable for people who are living alone and not with too large pets (as these may cause false alarms). The impact is positive for people with dementia (timely support in case of deteriorations, more freedom), their family caregivers (reassurance and control) and professional caregivers (more efficient care processes). There are comparable systems available from other brands (e.g. eLsa™ Activity Sensing; cAlarm Sense; AlleenThuis).

SPOTTER – GPS tracker

Spotter¹¹⁰ is a compact device with a movement sensor that people can take with them (in a pocket, purse or handbag) or that they can wear as a watch. The Global Positioning System (GPS) determines the actual location of device. Assuming that the person has the device with them, this allows for locating the person quickly. The location can be displayed on a Google Maps map through an online account. It is also possible to view the locations on the go via the free app for the Smartphone and Tablet. Caregivers can receive an alarm when the persons move beyond a predefined area (i.e. geofencing). Further, a SOS button can be pressed, and the caregivers receive the location and can take action. It is also possible to make contact (phone call) with the person who sent the SOS¹¹¹. Spotter is on the market in the Netherlands and users can locate persons all over Europe. There are various target groups, such as people with dementia and their family caregivers, children and their parents, dogs and their owners, etc. There is no recent data about the number of users, but a rough indication about the level of use can be deduced from the reviews on the manufacturer's website¹¹²: 687 reviews in the past 12 months. Also, on their website a reference is made to a relatively well-known online reference site (Kiyoh)¹¹³ which indicates that this technology is well appreciated (8.7 out of 10) and 95% would recommend the device to others. However, it should be noted that review sites can be easily manipulated. Making use of the idea of geofencing, Spotter allows people with dementia a degree of freedom to roam freely in a predefined geographical area while providing an increased level of safety and peace of mind. This comes at the expense of having to hand over privacy sensitive data about a person's location. In the past we have seen that such information can potentially be used for different purposes than the manufacturer initially intended (Neven, 2015). For family caregivers it can be reassuring to use Spotter as they can easily trace their relatives in case they are lost. The main benefit is that it allows people with dementia a degree of freedom, which is particularly beneficial to people who enjoy walking or feel the need to wander. Other strengths are that is a simple device and compact, easy to order via mainstream retailers and use and relatively affordable (prices start at €72) which means many people can buy it without having to rely on

¹¹⁰ <https://www.spottergps.com/>

¹¹¹ Technologie voor zorg en ondersteuning in de wijk (Technology for care and support in the district)

¹¹² <https://www.kiyoh.com/reviews/1056493/Spotter%2BBV?from=widget&lang=nl>

¹¹³ <https://www.kiyoh.com/reviews/1056493/Spotter%2BBV?from=widget&lang=nl>

a government subsidy. A weakness is that it needs to be charged, which might be difficult for people with dementia and location data could be abused as mentioned above.

MEDIDO – automated pill dispensing

Medido¹¹⁴ is a smart medicine dispenser which is especially suitable for older people who live at home, need to take different medicines and may occasionally forget this. With this device, care workers do not have to visit several times a day for a check-up, and it is pleasant for older people that they regain control over their lives. This technology thus promotes autonomy and facilitates ageing in place. There are a number of smart medicine dispensers on the market such as the Medido from innospense, the Spencer from Philips and cMed plus from Focuscura. Like the other two, Medido reminds the client to take (the right) medication. The personal medication roll (a Baxter roll, provided by a pharmacy) is loaded into the device by a health care professional. In the roll, the medicines are sorted in bags per intake time. When the client needs medication, the device emits a reminder sound. The user presses Ok to release the medicine bag from the device. The package opens automatically. If the user does not respond to the sound and does not tear the bag off the roll, a message is passed on to the care organisation. A care worker will then contact the user by telephone or visit if necessary. The medicines are supplied by the pharmacy and the Medido is filled weekly by a home care worker. There are approximately 4,000 users of Medido in the Netherlands.¹¹⁵ Nevertheless there are questions from the parties involved about the financing of this technology (prices may thus differ with differences in municipalities, health care insurers, care organisations etc.). Recently, Vilans and healthcare providers started an initiative in which business cases for the implementation of healthcare technology are developed. Jacqueline van Ginkel of TWB Thuiszorg says: “The interesting thing is that it is not just about simply introducing the Medido, but that you are introducing a whole new way of working. For example, care staff make a round administering medication several times a day. This means a different way of working, which offers different kinds of benefits to the carer. You have to be able to measure and substantiate that the new working method benefits the provision of care. We will be doing this in the near future in collaboration with other healthcare organizations, research groups and healthcare buyers. (...). Vilans coordinates the project.”¹¹⁶ Strengths of the Medido are that home care does not have to come over several times a day for a check-up, giving older people more control over their lives. A client does not have to wait for the home care worker to come and administer the medicines. People can also travel as the system allows them to take packets out for several days in advance (this setting can be changed for people for whom this would be dangerous). Weaknesses of Medido are that there are questions about financing and social contact with care workers is also reduced which does lead to increased loneliness in some cases.

¹¹⁴ <https://medido.com/>

¹¹⁵ <https://www.domoticawonenzorg.nl/dementie-thuis-medicijn dispenser.html>

¹¹⁶ Vilans - Zorgaanbieders ontwikkelen maatschappelijke business cases.

Communication, social contact, organisation and accessing of (informal) care

COMPAAN – Tablet to connect and do activities

Compaan is a special tablet (based on a Samsung tablet) with software to help older people and people with up to mild dementia to easily surf the internet, stay in touch (e-mail, Skype®), receive and view photos and play games. Informal carers can communicate with older people and use specific care-related functions (e.g. medication reminder, good morning notification) and organisation-related functions (e.g. shared agenda and contact via the family portal). The family portal is an online environment where family members who are connected to the system can send messages, photos, videos and have contact with each other. They can also remotely solve 'problems' with the tablet (e.g. reboot) and see what the older person is doing on the Compaan. Professional caregivers can provide online care, such as medication reminders and monitor the intake via a video connection, share videos to improve rehabilitation and do online assessments. Compaan is used by older people in general, people with dementia, family members and professional caregivers. The exact number of users is not known, partly because many Compaan tablets have been ordered in the past months due to the corona virus. It is said to be used by “thousands” in the Netherlands, both individual users, care organisations and municipalities.¹¹⁷ It is also used in Europe outside of the Netherlands but much less often. There is a selling point in Belgium and Switzerland (where it is called Amigo) and Compaan is translated in various languages, e.g. Spanish, German, Italian. A master thesis showed that the Compaan led to feelings of calmness and control, improved communication, easier organisation of care and feelings of joy and satisfaction for informal carers (Schuiteman, 2017). The use of this type of technology also offers the opportunity to work together in an integrated way. In this corona period, it is expected that Compaan is being used a lot more as it provides the opportunity to stay connected via videocalls. People with dementia remain connected with their social environment in an easy way, and they can enjoy activities, family carers have easy contact with their relatives and can keep an eye on them. Professional carers have an easy means to communicate and to deliver online care. Compaan may promote equality as it allows people with reduced mobility and relatively low digital skills the opportunity to take part in various digital activities which may be beneficial. The tablet has various functionalities, and these can be attuned to the needs of the user. Technical support (9–18 hrs) is available via telephone or email. A disadvantage is that people cannot use their own tablets and that the costs are perceived as high by an independent consumer organisation.¹¹⁸ The technology can be ordered online only. Following this there is a two-week trial period. Some municipalities offer this tablet as part of supporting the family carers and care organisations (home care and intramural care) offer the tablet to their clients (on loan). Individual users have to pay for the tablet (€299) and for the subscription (€12.95 per month). Compaan

¹¹⁷ <https://www.uwcompaan.nl/>

¹¹⁸ <https://www.consumentenbond.nl/tablet/compaan-connect>

may introduce new digital vulnerabilities and privacy issues and it is not suitable for people with more severe dementia.

TESSA – Social robot

Tessa is a robot – with only a face for expressions, but no body – that gives verbal reminders, can recognize speech of the user (and react to answers on closed questions) and it can play music. It works via a connection to the Wi-Fi network. There is a web app that can be used by family carers or caregivers with any smartphone, tablet or laptop with internet access. Here they can set reminders/messages at a chosen time, as well as favourite music. Prior to pronouncing this reminder/message, a tune sounds to attract attention.¹¹⁹ Tessa is used by people with forgetfulness and dementia and also people with malnutrition, with dependency for ADL or who otherwise have difficulties with keeping a daily rhythm. It is used by persons living at home, by home care organisations and in intramural settings. The Tessa robot is currently used by over 1,000 clients and over 80 care organisations.¹²⁰ It can help to create a better life by reminding and helping people with keeping appointments, carrying out routine actions, stimulating activities and inviting them to social activities. Some small studies and one larger R&D study¹²¹ showed that it helped users reach their goals and improved quality of life. A small study for the municipality of Zoetermeer found that Tessa helps older people with remembering various daily activities and that their informal carers were also happy with the performance of the robot.¹²² Family carers experienced fewer conflicts, felt more relieved and had more time to spend for themselves. Also, they considered Tessa easy to use. Quality of care improved, and nursing home admission seemed to be delayed, though further research is needed. Another small (Vilans) study found that Tessa can help older people with dementia with activities of daily life and that care workers have a positive view of Tessa, but responses from older people were mixed.¹²³ For individual users, the robot may be expensive: the Robot is about €300 and a subscription of about €480 for one year. This thus means that it is not available to everyone.

MAATJE – social robot

Maatje is a social humanoid robot and can help someone with the daily structure and activation. In addition, Maatje can be used as a therapeutic aid in youth care and physiotherapy. As such it is, like many technologies listed here, a technology that can be used for people with dementia, but also for others. Robot Maatje can help people with mild intellectual disabilities or forgetfulness with daily activities. For example, Maatje gives a signal when someone has to put on their clothes, when to take medicines, when it is time to eat, or to exercise. Robot Maatje offers structure and fun. The small robot, for example, supports people with dementia with a mild intellectual disability and functions as a

¹¹⁹ <https://www.tinybots.nl/zorgorganisaties/home>

¹²⁰ <https://www.tinybots.nl/zorgorganisaties/home>

¹²¹ <https://www.tinybots.nl/zorgorganisaties/home>

¹²² Resultaten pilot met Tessa in de gemeente Zoetermeer i.s.m. zorgorganisatie Vierstroom

¹²³ <https://www.domoticawonenzorg.nl/robot-tessa-nuttig-voor-mensen-met-milde-dementie.html?highlight=tessa>

therapeutic aid in the youth care and physiotherapy.¹²⁴ There are no numbers available about the number of consumers who are using the Maatje. Maatje is relatively new so we do not expect the number of users to be very high. Margot Neggers from Eindhoven University of Technology explains how different robots can contribute to better care for the client. She explains that many older people see a robot as a buddy, robots can lower the stress levels and lower the feeling of loneliness, it can improve communication with and between older people and cognitive skills can deteriorate less when an older person plays a game with the robot.¹²⁵ Supervisors or family members can record messages via a special app which the robot can say at specific times. A feature of Maatje is that it can also move and has human traits. For example, Maatje can sneeze. It is also possible to pre-program words and sentences so that a dialogue can arise between the user and the robot. For example, the word pancakes. When Maatje hears this, he helps with the recipe. The user can also create QR cards to interact or play with Maatje. Maatje is currently used in the Netherlands for: – youth Services – handicapped, intellectual disability, autism – elderly care, dementia, loneliness – hospital, pain distraction, guidance, explanation, rehabilitation – physiotherapy: presentation of exercises. Strengths of Maatje are that this interactive humanoid robot can be used to activate, animate, rehabilitate, distract, reminiscence, communicate and facilitate social contact. It can thus serve many purposes. Weaknesses are that prices are not transparent, and it does not work with iOS, only on Android and in general using a care robot is not suited for every (older) user.

YOOOM Video app

The Yoom Video app is a free app which enables videocalling. The app can be installed on an Android phone or tablet. It can be used as one of the apps on a tablet or the app can replace the start-up screen of the phone or tablet after which only videocalling is available. Family members can easily install the system and the people who allowed to connect via this system are regulated by the family. Only a registered family can connect.¹²⁶ Yoom was developed in an international project for people who have low digital literacy, but the original device developed in that project is not market ready. Instead, based on this study, an app was developed which is available on the market. It is used by people with (mild)dementia or forgetfulness and people who have problems using more complex applications, and their families. The developers think the app is used by approx. 200 people.¹²⁷ Although stakeholders mention the ease of use and consider it an easy tool to stay connected, there are no published research results to confirm this. For people with dementia Yoom may help to stay in touch with their family in an easy manner. Also, when verbal conversations are hardly possible, people can have contact via video images (for instance seeing your family have dinner and ‘participate online’). For family it is an easy way to connect despite long distances. The app is available for free and it works intuitively so also people with less digital literacy may be able to use the technology. A strength of Yoom is that is developed

¹²⁴ <https://smartrobot.solutions/portfolio-item/maatje-zorg-robot/>

¹²⁵ Vilans (2018, April 11): *Zorgrobots laten zien wat ze kunnen op robotparty*.

¹²⁶ See <http://www.aal-europe.eu/projects/knk/> and <https://www.yoom.nl/pages/family-app> for more information about Yoom.

¹²⁷ *Ibid.*

following an European AAL project with a user-centred/participatory design approach.¹²⁸ It can be an easy means of contact in cases where face-to-face contact is more difficult, when family lives further away or when visits are not possible, like in this corona time. A disadvantage is that no research results are available yet, so the relative value to technologies such as Skype©, Zoom© or Facetime© are unclear. It is also not yet possible to use it on Apple devices.

MYINLIFE – Organizing care

Myinlife¹²⁹ is a free online social support platform, where a primary caregiver of a person with dementia can invite friends, family, and significant others to help in caring for their relative. There are three personal support circles (i.e., inner, middle, and outer circle, depending on the closeness of the relationship), with different privileges. The primary caregivers decide what to share with whom. The platform consists of the following functionalities: profile, circles, timeline, calendar, helping, personal messages, care book, and compass. These functionalities provide opportunities to share care information, messages, pictures, and requests for support. Myinlife can be accessed via a (tablet) computer or app. Myinlife is on the market (for free) and applied to family caregivers of people with dementia who can use help of friends, family or volunteers in taking care of their relative. There are around 879 networks who use Myinlife, with in total about 3,000 members. Myinlife was well received by primary caregivers who were interested in this technology (Dam et al., 2017). It facilitated empowerment, openness, involvement, and efficient care organisation. Regarding equality, it is positive that it is available for free, but it is probably more easily used by family caregivers who have a positive attitude towards technology and are not already too burdened to try a new device. Strengths are that Myinlife is developed in an iterative development process with potential users, clinicians and web-designers (Dam et al., 2017). It proved a useful instrument for efficient central care coordination and mutual involvement. It is available for free and downloadable from the website of the National Dementia Foundation. A weakness is that people need a certain level of digital literacy and willingness to work with such a technology. Perhaps more importantly, they may have to overcome a barrier to ask help from their social network which can be difficult (Ten Bruggencate, 2020). The impact is improved organisation of care and empowerment of informal caregivers, the potential could be that they can continue to take care at home for longer and postpone nursing home admission.

SOMNOX – Sleep robot

The Somnox is a robot that helps people sleep. The technology calms the mind and body and improves night's sleep.¹³⁰ Somnox is a soft, cuddly robot, which does not resemble a human or an animal which is unusual (its shape is like a big bean). Somnox simulates breathing movements. If you hold it close to

¹²⁸ <http://www.aal-europe.eu/connected-vitality/>. Unpublished research papers on the project that led to Yoom can be found here: <http://www.cs.ucy.ac.cy/~aachila/publications/eGeH2013-CameraReady.pdf> and <http://www2.cs.ucy.ac.cy/~george/files/ITI13.pdf>

¹²⁹ <https://www.myinlife.nl/nl>

¹³⁰ <https://meetsomnox.com/nl/sleep-robot/>

you, you will unconsciously breathe more calmly and fall asleep more easily. You can switch Somnox on and off via a control panel. In addition, you can set the sleep robot to your own preferences, thanks to a special app available for a mobile phone.¹³¹ There is no data available about the number of consumers who are using the Somnox. However, pricing is very transparent with main Dutch retailers (like bol.com) selling it for €599. Somnox is relatively new and we do not expect this technology to have a very wide user base yet. On the website of Vilans, an independent government agency, an employee of Zorggroep Solis says about Somnox: “We have residents who like Somnox very much and especially like that they have something with them. Something warm with which they can cuddle. Since it simulates breathing, it also feels very pleasant”¹³². Benefits for older people may be falling asleep more peacefully and sleeping better, relaxation and more rest, a feeling of security, more energy and alertness during the day. Benefits for care workers may be prescribing less medication, distributing attention more evenly to clients, less alarms at night. A weakness may be that a cover for the Somnox that you can wash out was only added recently, but this cover is not waterproof.

High need care, behavioural and cognitive issues

PARO – robotic seal

PARO is a robotic seal that can be used for relaxation and therapeutic purposes. This stuffed animal robot stimulates interaction and activates or calms people. Through the sensors under his fur coat, he responds to sound, touch and movement.¹³³ The PARO is on the market, the company Focal Meditech represents and sells the PARO in the Benelux. PARO is one of the oldest and most known care robots in use today. This technology is useful for people with relatively severe dementia, mentally and or multiple disabled people, and for children with an autism spectrum disorder. According to Lisa de Leeuw of Focal Meditech, 300 units have been sold in the Netherlands and Belgium. In our experience PARO divides opinion: some are very positive while others are not. One of the downsides that is often mentioned are the costs (€6,000) of PARO which many healthcare organizations consider as very expensive.¹³⁴ There are debates (and studies) about the cost effectiveness of PARO. Moyle et al. (2017) conclude “Our findings partly support the efficacy of PARO, but also suggest that, when there are limited resources, a soft toy animal may be used effectively with a person with dementia. However, PARO should not be used to replace staff time, but rather be used during those inevitable periods when staff are otherwise occupied, or when the individual may benefit from comfort from PARO.” (p. 772). Mervin et al. (2018) state that PARO is nearly as cost effective as a plush toy and more cost effective than other psychosocial interventions. Hygiene is also perceived as a problem as PARO’s fur can only be washed by the supplier, which is expensive.¹³⁵ Care organization Meander has experience with the use of PARO.

¹³¹ Thuisleefgids: De Somnox Slaaprobot.

¹³² Vilans: De voordelen van technologische innovaties in de zorg.

¹³³ Focalmeditech. (n.d.) Wat is Paro de robotzeehond?

¹³⁴ Zorgvannu (2019, January 25): Robotica in de zorg.

¹³⁵ <https://www.zorgvannu.nl/blogs/praktische-tips-voor-de-hygiene-van-knuffelrobots-en-zorghorloges>

They use it with older clients to prevent anxiety or to reduce anxiety medication. Meander is very positive about the use of this cuddly robot.¹³⁶ Jones et al. (2018) state however that PARO works less well when people are already very agitated, better results are achieved in people with low and moderate agitation. From personal experience with using PARO in a residential care setting we know that PARO does not work for everyone – older people with dementia are diverse too – and that PARO's effectiveness is largely dependent on the skill of the person who introduces PARO to the person with dementia. PARO stimulates interaction and ensures rest or activation; this last feature depends on the needs of the older patients. A practical example we observed ourselves – and have written about¹³⁷ – is of an older woman we will call Klaartje. Klaartje has actually always been a sweet woman and mother, but since she has dementia, she often becomes verbally aggressive, also to her own daughter. It is painful to see your mother living with dementia, but Klaartje's aggression makes it an exceptionally difficult task for her daughter to be with her. PARO was introduced in this situation. Klaartje's aggression reduced, but more importantly, Klaartje likes to talk to PARO and to talk about him. That in turn makes it possible for her daughter to talk to Klaartje about PARO and the crazy things he was doing. Thus, PARO allowed mother and daughter to engage in a joint activity. PARO is a means to activate some older people with dementia and thus include them in everyday activities. PARO is not a panacea, but we have also seen spectacular successes with PARO.¹³⁸ Moyle et al. (2019) state that family members of the person with dementia react positively to PARO perceiving improvements in mood, less agitation and providing opportunity for communication. This points to an interesting and somewhat controversial observation. The person with dementia is not the only user. The family of the person with the dementia and the care staff using PARO also matter. Strengths of PARO are that it can activate or calm older people with dementia. Sometimes it is one of the only things that can lift people out of a lethargic state. Weaknesses of PARO are that it is an expensive robot and is difficult to clean. Especially concerning COVID-19, this is a downside.

CRDL – interactive care instrument

The CRDL (pronounced cradle) manufacturer states that CRDL is an interactive care instrument that emits sound when people place one hand on the CRDL and join hands with each other. This makes new contact possible for people who have difficulties with communication and social interaction – such as people who suffer from dementia, autism or people who have a learning disability.¹³⁹ There is no data available about the number of consumers who are using the CRDL. Given the fact that CRDL has been on the market for a number of years and there was a lot of publicity around it in the Netherlands we estimate the use to be several hundreds, though again – as for many care technologies – this data is not available. Pricing is transparent at €3,950¹⁴⁰. Luyten et al. (2018, p. 2) state that “CRDL creates an atmosphere of playfulness and curiosity. It lowers the threshold to touch, provides an incentive to touch

¹³⁶ <https://www.zorgvoorbeter.nl/veranderingen-langdurige-zorg/robots-in-de-zorg/paro>

¹³⁷ <https://www.avans.nl/binaries/content/assets/nextweb/onderzoek/active-ageing/column-agressie-louis-neven.pdf>

¹³⁸ https://www.avans.nl/binaries/content/assets/nextweb/onderzoek/active-ageing/column_cappuccino.pdf

¹³⁹ Wat is de CRDL? <https://crdlt.com/>

¹⁴⁰ https://crdlt.com/static/docs/CRDL_Financiele_verantwoording_gebruik.pdf

and encourages to experiment with different types of touches on arms and hands. The sounds the CRDL produces sometimes trigger memories and provide themes to start and support conversation.” Teunissen et al. (2017) report that in one-on-one interactions CRDL leads to pleasant experiences and that it leads to more contact with the person with dementia. Moreover, they state that CRDL may help health care professionals and people with dementia interact better. The CRDL receives high ratings from family members, caregivers and specialists in healthcare. For instance, employee Mirjam from care organization Lyvore says: “Older people are often not touched normally. I have seen elderly people who came from a deep dementia with this kind of technological means. Magnificent.”¹⁴¹ People with dementia are sensitive to sensory stimuli, such as changing movements, touch and sounds. The CRDL translates touch into sound. The CRDL was developed from the belief that a person’s primary needs are personal attention and contact in every phase of life.¹⁴² The aim of the CRDL is to breakthrough social isolation and to enable new forms of contact, based on what a person can still do. Thus, communication is facilitated which does not rely on cognitive ability, but rather on attention, patience and touch. This creates a form of equality whereby each participant has equal opportunities to make contact and enjoy each other’s actions and presence. One potential downside could be that careful assessment is needed to avoid unwanted touching. Also, given the fact that CRDL partly relies on touching other people COVID-19 has rendered it more difficult to use.

ROBOT CAT – Interactive Robot Cat

The robot cat is an interactive pet that reacts to touch, light and sound through various sensors. The cat has a number of ‘programs’ which result in a few different ways of responding. The cat can respond by meowing, purring, washing his paw or rolling over. These cats are used as social robots, for example to reduce loneliness in older people, to reduce restlessness or unexplained behaviour or to increase social contact. In addition, many other goals and target groups are conceivable. They are often seen as a toy, but with a price of around €140 are also seen as a cheap alternative to robots like PARO.¹⁴³ This interactive robot cat has been specially developed for elderly care.¹⁴⁴ There are no numbers available about the number of consumers who are using the Interactive Robot Cat. An estimate is hard to give, but this is a technology that is quite common in care homes in the Netherlands. The various reviews provided on a platform that is independent of the manufacturer show that caregivers have positive thoughts about this technology. They immediately see the effect on their loved ones. “The robot cat is really great! Especially now in this difficult corona time and we cannot visit my father in the nursing home, my father is so happy with his cat. He talks to it and strokes it”¹⁴⁵. The robot calms people and allows for talking to it.¹⁴⁶ The cat is a relatively affordable technology. Weaknesses of this robot are that,

¹⁴¹ Zorgtechnologie-geeft-vrijheid-en-veiligheid.

¹⁴² Interactief zorginstrument CRDL stimuleert betrokkenheid van ouderen met dementie

¹⁴³ Interactieve Robot Kat voor Dementie - Oranje

¹⁴⁴ <https://www.dementie-winkel.nl/knuffeldieren-interactieve-kat-ouderen>

¹⁴⁵ Dementiewinkel (n.d.) Reviews

¹⁴⁶ Vilans (n.d.): Hoe zet je robots succesvol in als zorgorganisatie

like PARO, this robotic cat cannot be washed so questions about hygiene persist, which will be amplified during the current COVID-19 pandemic.

TALKING PHOTO ALBUM

Talking photo album, a photo album in which a personal message can be recorded under each photo. As such it allows for reminiscence. The talking photo album is also useful for creating visual manuals supported by audio (you can record for 18 seconds per page). It could also be used as an aid for people with early stage dementia to receive instructions for everyday life activities, but it is mainly used for reminiscence. This technology is on the market and can be used for different target groups. There are no numbers available about the number of consumers using the talking photo album, and considering that it can be used as a care technology but can also be used by others, such sales figures would not be relevant unless specified for specific user types. But as this is a relatively cheap technology – one store offers it for €52¹⁴⁷ another for €48¹⁴⁸ – we expect that the number of people who are using the album could easily be in the hundreds or thousands. Reviews show that it is easy to use and our own experience confirms this.¹⁴⁹ This technology is mainly an infrastructure. Although in general reminiscence is important for older people and people with dementia and often well appreciated, the attitudes towards the talking photo album will largely depend on what kind of memories are evoked by the pictures and sound messages in question and not by the technology itself. Strengths of this technology are that you can reminisce in a fun way. It is cheap and easy to use. A weakness is that you cannot turn the volume up or down, which may be a particularly big problem for older people with hearing problems.

TOVERTAFEL – interactive table game

The Tovertafel or “magic table” is an interactive game with a focus on activating get older people and getting them to start moving.¹⁵⁰ A computer and projector mounted to the ceiling project images onto a table from above. The sensors monitor and respond to the arm and hand movements of people sitting at the table. Catching butterflies, throwing about a beach ball and sweeping up autumn leaves are some games you can play with the Tovertafel. Tovertafel was the result of the PhD thesis of Hester Anderiesen (2017). Active Cues, the company behind Tovertafel, develops games for special target groups, such as people with dementia and people with intellectual disabilities, from the point of view that many people love to play games and that playing can positively contribute to everyone's health and quality of life. It is an inclusive technology that makes games accessible for everyone including people with (mental and cognitive) disabilities. Like so many care technologies, there is no data available about the number of people who are using the Tovertafel. Nevertheless, from experience we know that this is a relatively common technology in care homes. We would estimate that there are dozens if not hundreds of these in use in the Netherlands. Pricewise, Active Cues does not list a price on their website, but from personal

¹⁴⁷ <https://www.dementie-winkel.nl/Pratend-fotoalbum>

¹⁴⁸ <https://www.nenko.nl/pratend-fotoalbum/>

¹⁴⁹ Nenko. (n.d.): Plus en minpunten

¹⁵⁰ Wat is de Tovertafel Original? <https://tovertafel.nl/original/>

experience and knowledge of fundraising activities by our students we know that the price lies around €7,000 including several years of servicing and software updates. Like many technologies for older people (with dementia) some people react very well to this technology whereas others do not. Our personal experience is that in practice this technology is quite popular in care homes and residents have been known to be very sad when the Tovertafel is moved to another group or room in their care home. Tovertafel can help people by facilitating play, activation, relaxation, engaging in playful exercise, and doing things together with others. Indeed, Anderiesen (2017) and Bruil et al. (2018) show that co-designed serious games can play a beneficial role in the dementia care context. Bruil et al. (2018) show that playing with the magic table seems to lead to a better quality of life by nursing home residents with moderate or severe dementia. Strengths of Tovertafel are that it stimulates older people to exercise, to play and join others in a fun activity. It can thus relieve apathy. Weaknesses are that currently the magic table has to be hung from the ceiling (i.e. only in one place) but it would be great if the table were mobile. This will ensure a more flexible use of the magic table.

Innovative stimulating of exercise for older people

SILVERFIT MILE (exergaming – interactive cycling)

The Silverfit Mile consists of a stationary bicycle with sensors that interact with a screen. The screen consists of a film with a route (a contemporary or historical route) and the cycling pace of the participant determines the speed of the film. Thus, physical exercise is interactively combined with cognitive stimulation in a gaming environment (called exergaming). Also, other films can be used (e.g. a personalized route) and other equipment, e.g. any home trainer, active-passive trainer (e.g. Thera trainer, MotoMed) or treadmill. Because films are shown, this also invites to socially interact with other participants and informal caregivers. The Silverfit Mile is on the market and there are various brands next to Silverfit (see e.g. Fietslabyrint below). It is used in nursing homes, day-care centers and physiotherapy/training centers. The main focus is on rehabilitation or increasing physical fitness of older people. It is also used with people with dementia. This requires more guidance. Partly because of commercial interests, the exact number of users is unknown. There are about over 1,500 systems (various brands) in the Netherlands in Nursing homes, day care centers, geriatric rehabilitation centers and physiotherapist practices (with focus on older people).¹⁵¹ People with dementia and older people seem to find this a pleasant way to exercise. They often prefer cycling outside, but this is not always possible because of fear of getting lost or falling or due to weather conditions, so Silverfit Mile is seen as a good alternative. Family and staff are also positive about this technology (Van Santen, 2020). Positive effects of exergaming were found on physical, cognitive, and emotional functioning in people living with dementia in a review by Van Santen et al. (2018). In a cluster randomized controlled study, Van Santen et al. (2020) showed statistical significant effects in favour of exergaming with among other brands Silverfit Mile (compared to regular activities in a day care center) on cognition and social behaviour of

¹⁵¹ <https://silverfit.com/en>

the participant with dementia. Also, clinically significant effect sizes were seen for improved physical activity. The informal caregivers felt significantly less distressed and more competent to care for their relative. Silverfit Mile enables people with dementia who are afraid of exercising outside, to participate in this activity and to engage in ‘travelling virtually’. The equipment varies in parts and prices but is not cheap – prices online are only available on demand and subject to change, however, on fundraising sites a price of €7,685 ex. VAT is mentioned¹⁵² – so not all day care centres have this equipment. Moreover, staff time is needed to help people. Strengths of Silverfit Mile are that it is appreciated by a large group of users, that research shows its effectiveness and that it is well established on the market. Weaknesses are that staff is sometimes needed to be able to use the equipment and that the price may be too high. The potential is that people with dementia and informal caregivers benefit from it (see above), as well as people in geriatric rehabilitation (improved condition).

FIETSLABYRINT – interactive cycling technology

The bicycle labyrinth is an application on a computer that allows people to make interactive bicycle trips through cities and nature reserves. If the cyclist starts pedaling, the cycling route also starts to move on screen. The images are real videos (not Google street view) and at some intersections the cyclist even can choose which way to go. There are between 10 and 20 routes installed on the Fietslabyrint. These can be selected from a database of 300 cycling routes at home and abroad. Often routes of hometowns of people are selected enabling people to cycle through their own towns (which facilitates conversation and reminiscence). Fietslabyrint differs from Silverfit in the sense that it only allows cycling and it is not intended as a game. There are no rewards in the game and the pace of the video does not increase when you peddle faster. A fun activity without the (implicit) requirement of performance is the goal.¹⁵³ Bicycle labyrinth is widely used in elderly care, in care for the disabled people, rehabilitation centers and hospitals. People who cannot cycle outside independently can make virtual cycling trips with bicycle labyrinth and discover the world from their home or care institution. The realistic cycling experience brings the outdoors inside and makes people feel like they are out and about. This makes cycling on an exercise bike much more attractive. There is no data available on the number of consumers who are using the bicycle labyrinth, nevertheless it is a fairly common care technology. We would estimate that around 100 care homes or physiotherapy practices have this technology. A user speaking: "I love cycling, time is going fast. Usually I get bored quickly because it is monotonous if you don't see anything."¹⁵⁴ Attention is drawn to the scenery on screen which facilitates conversation and reminiscence and draws away attention from e.g. pain and monotony experienced during exercise. Karsemeijer et al. (2019) shows that bicycle labyrinth is an effective method, for older people with dementia, to do more exercise. Vulnerable older people can also enjoy a form of outdoor activity and can e.g. see what kind of things

¹⁵² See for instance: <https://www.doneeractie.nl/silverfit-mile/-29082#:~:text=De%20fiets%20kost%20%E2%82%AC%207.685,vanaf%20een%20zeer%20laag%20niveau>

¹⁵³ Personal communication (LN) with the developers of Fietslabyrint

¹⁵⁴ <https://www.fietslabyrint.nl/referenties/>

have changed in their hometowns without leaving their care home. The strengths of Fietslabyrint are that cycling routes on screen provide recognition, distraction and a topic for conversation, so that people cycle longer and improve their fitness in a relaxed way. Bicycle labyrinth increases the pleasure in movement and contributes to the well-being of people in care institutions. Weaknesses are that it is too expensive to purchase for private use (approximately €1,350 without the exercise bike)¹⁵⁵. In the past the lifelike movies resulted in people trying to “steer” the exercise bike around objects on screen which could lead to (near) falls. However, Fietslabyrint has since adapted the way they film their videos so that they do not pass closely to objects, preventing this problem from occurring again.¹⁵⁶

PILLO GAMES – accessible gaming using a pillow

Pillo is a game console that you control the games with a pillow as a controller.¹⁵⁷ Because the controller is a cushion, Pillo is suitable for everyone and challenges you to move and work together. By hugging, squeezing, shaking, rotating or pressing, everyone can play, whether you are young, old, fit, or suffer from an illness or (mental or cognitive) disability.¹⁵⁸ Pillo is a soft and light weight controller which is why Pillo is used for various applications in healthcare and beyond. There is no data available on the number of people who are using Pillo Games. As this is a relatively uncommon technology the number of users is hard to estimate. Pillo stimulates social skills and exercise. The games are for all ages, non-violent and cooperative. Young children can play together with each other or with older people, such as grandfather or grandmother. Pillo could be used at various elderly care institutions, nurseries, primary schools and meeting places. Strengths are that older people do not notice that they are moving during the game as they are playing. Weaknesses are that older people find it difficult to turn on Pillo. This requires the help of healthcare providers. It is unclear how high the cost of Pillo games is, but costs are also comparatively high, particular in relation to alternatives like a Nintendo Wii or other games consoles which can be controlled with motion.

MOOFIE – enhancing indoor exercise

Moofie, Moofie is an illuminated stick that gives voice commands. This is a technology for healthcare institutions that want to encourage indoor exercise. Moofie provides spoken commands aloud, and supports them with light, sound and recognizable music. The use of this product requires little prior knowledge. You turn it on with the only button on it, and the Moofie tells you exactly which choices you can make by touching a coloured area. In addition to facilitating moving, the Moofie also has room for games, audio stories and a memory function. Furthermore, the Moofie in the charging station can

¹⁵⁵ Like Silverfit prices are only available on demand and may differ depending on what you buy as well as fluctuations in the market. However, as an indication, on a fundraising site we find a price of €1,350. This probably excludes the exercise bike which needs to be bought separately. <https://www.whyonate.nl/fundraising/geef-de-bewoners-van-moriahoeve-ee-fietslabyrint-pc19/nl>

¹⁵⁶ Personal communication (LN) with the designers of Fietslabyrint

¹⁵⁷ <https://pillo.nl/english/>

¹⁵⁸ Video games besturen met een kussen. <https://www.zorgvannu.nl/oplossingen/video-games-besturen-met-ee-kussen>

function as a lamp. In this way, the Moofie can always be within sight of the client which may help it being used.¹⁵⁹ There are no data available about the number of users/consumers who are using the Moofie. However, on their website Moofie claims to be in use in a couple dozen care organisations. Unusual for a care technology, the company that sells Moofie is very transparent about the price (€824)¹⁶⁰. A psycho geriatric activity supervisor says – on the Moofie website – “We are all very enthusiastic about Moofie. This applies to our residents, but also the employees. The latter is of course also very important for us. [Older] People who are difficult to stimulate [to move] can easily be persuaded with the Moofie to exercise and can often do more than you think.”¹⁶¹ The intention of Moofie is to get older people to exercise in a fun way¹⁶², which is an approach that is very common in the Netherlands (e.g. Pillo games, Tovertafel etc.). Strengths of Moofie are that it is fun and easy to use (voice instructions are easy to follow). Moofie is also easy to clean. Weaknesses are yet unknown. In general, this is a new technology and relatively little is known about the actual use practices of it.

ACTIVITY TRACKING

Another clear trend in the Netherlands is the use of activity trackers by older people as a preventative care technology. Activity trackers, also those included in smartwatches and dedicated trackers like Fitbits measure someone's movement during the day (such as steps, active hours and calories burned) Often it is also possible to see how long and how well you sleep. Activity trackers are a common technology, also for older people. The Happy Walking project showed that older people are positive about technologies like activity trackers as they see this as a means to remain independent for longer.¹⁶³ Although we do not have specific information for older people, the demand for smartwatches increased sharply over the last years. In 2017, an estimated 29.3 million smart watches were sold worldwide, in 2018 it was more than 45 million.¹⁶⁴ These are obviously not all sales to older people, but older people are certainly a user group of this technology. According to Schlomann (2017) activity trackers may be used actively – to motivate older people to walk more – or passively – just to check how much you walked at the end of the day. She found that many older people use these trackers passively and suggests more customization options as a means to get older people more actively involved. People who have the money to spend on technologies like this may also have a better health outcome, thus increasing inequalities. On the other hand, basic activity trackers are quite cheap, starting at €20 or less (but functionality increases with price). Strengths of activity trackers are that they can be a part of a healthier lifestyle and can provide motivation to exercise, also for older people. Weaknesses of fitness trackers are that they can introduce new norms of bodily health – such as the, rather random, norm to take 10,000 steps every day – that older people may not be able to reach or which could potentially put them at risk

¹⁵⁹ <https://www.moofie.nl/product/moofie-care/>

¹⁶⁰ <https://www.moofie.nl/product/moofie-care/>

¹⁶¹ <https://www.moofie.nl/referenties/>

¹⁶² About Moofie

¹⁶³ <https://www.allesoversport.nl/artikel/inzicht-in-sport-en-beweegtechnologie-voor-senioren/>

¹⁶⁴ Onemorething – Vraag naar smartwatches neemt hard toe

(Marshall & Katz, 2016). Other concerns are the use of health data by big technology firms and activity trackers may be less suited to slow walking older people as they may not record steps accurately (Lauritzen et al., 2013).

5.4.3 Summary appraisal of technologies in care in the country

For the Dutch context the Dutch team decided to add an additional part to their report to facilitate the analysis of good care and available care technologies in the Netherlands. This analysis relies on expert interviews or expert discussions focused on the underlying dynamics that shape or hinder the design and use of care technologies by older people which can help older individuals to live better lives. Given the outbreak of COVID-19, an additional question on COVID-19 and care technologies was added to these interviews. The results of this question already have been mentioned.

For this purpose, 6 expert discussions or ‘informal’ interviews (i.e. not to be confused with full academic interviews) were conducted with Dutch experts in the field of research on ageing and technology. All but one interviewee were professors at a university or at a university of applied science (or, in one case, both). One interviewee is an assistant professor at a university and is a prominent member of various international societies and organisations that work on ageing and technology. The interviewees represent a range of research approaches that span from more technologically oriented researchers to more socially oriented researchers. All researchers, however, have a focus on the design and use of (care) technologies that older people (could) use in their everyday lives. The interviews were semi-structured and lasted between 40 and 90 minutes. Interview questions included (but were not limited to): What do you consider the Dutch perspective on good care? How does care technology fit in with this? What bottlenecks can you see with regard to good care with technology? What should we be focusing on to improve the use and usefulness of care technologies? Which ethical issues around care technologies concern you most? These interviews were “informal” i.e. not intended to be full blown social scientific interviews and were thus not transcribed verbatim, instead extensive notes of the most salient points were taken during the interviews. From these notes key points were distilled and synthesized into a set of findings representing the views of these experts.

The results of the interviews were the following.

1. Focus on the older person, not the technology. Many technologies that were meant to be high-tech disruptive technologies have not made an impact on the life worlds of older people. These technologies have been developed for older people, but there has been insufficient attention for the *fit* of these technologies in the context of the lives of older users. The everyday should take priority over high-tech. We should be studying the *actual* use and skills of older people and the diversity therein. A source of inspiration lies in the resourceful solutions that older people come up with themselves. Such solutions are often cheap, understandable and quick to implement. Research should focus on what older people find interesting, not what researchers, designers

and engineers find interesting. Studies of use should be prioritised over design of new technologies.

2. New inequalities: is technology accessible for everyone? Old questions about the digital divide are now re-emerging around health care technologies. Affluent well-educated older people tend to have better technological skills, a better network and more financial means to use care technologies to stay healthy. Older people with less education and less resources also tend to struggle more with technology. They also tend to have poorer health. How do we make sure we are not creating a group of older people who are left behind in a world where care technology takes a prominent place?
3. Technology needs to facilitate wellbeing too. Currently many technologies for older people are aimed at care related tasks. The wellbeing of older people is much less a focus of the design of technologies for older people. However, a focus on wellbeing could generate many positive results and would indirectly also contribute to the health of older people (e.g. by helping alleviate loneliness). Particularly the option to meet and interact with others is seen as important. Technology should provide opportunities for activities that allow older people to fulfil meaningful roles in society. This requires technological, social and business innovation.
4. Do not focus on high-tech, but on implementation of existing low-tech and social innovations in their social context. Technology is not the limiting factor, understanding how technologies work in the everyday lives of diverse older people is. Moreover, innovation does not need to be technological, social innovation can be valuable for older people as well. Any innovation relies on social and organisational embedding, which is key to the success or failure of a technology. We should ask what is a “working” technology? One that technically functions but is not used or one that is embedded in the lives of older people in a meaningful way and is understood and appreciated by formal and informal care workers? How are old age and technology co-constituted and what does that teach us about how to design and implement technologies? More attention is needed for ethics. What is good care with technology in an ageing world?
5. Methods: How to give older people a genuine voice in design processes. Be careful of reducing older people to a set of “needs and requirements” or a set of parameters to design to. We need methodological innovation to make quicker and better decisions during innovation processes. This means that older people should be involved much sooner and be taken more seriously in design processes. Giving older people a genuine voice in design processes is considered very important by the experts interviewed. Care workers are also an important group. Pilots are seen as a risk. Many pilot projects with older people and technology claim to be a success, however, post-pilot implementation of these technologies into the everyday lives of older people is often low. Focusing on pilots is thus a risk. How we innovate for older people should be a focus of study. Current design methodologies too often lead to technologies that do not fit in with the life world of older people.

6. New ways of organizing care across disciplinary boundaries. There is a need for more interprofessional work. The divides between health care, social care and technology as separate domains should become less. This means that different types of professionals should learn to work together, but also that different partners on an organisational level should cooperate better. Particularly the role of social care should be expanded. And informal carers should receive more support (by technology) as they are a key factor in the maintenance of care to many older people. Improving logistical planning in care was also mentioned. How can we improve cross-disciplinary work? What organisational, social, financial and technical innovation can facilitate this? How can care organizations work on a better overarching idea of what care technologies for older people could mean for their clients?
7. Research into effectiveness and financial efficiency of care technologies. Care finances in the Netherlands are very medically oriented. There is a strong focus on treatment and not on social support or prevention. The financial structure does not fit with an integral view on health, care and prevention. This also includes the reliance on the state and health insurers to be the provider of care technology. How is the system structured in a financial way? Does that help or hinder the implementation of affordable care technologies for older people? The interviewees state that currently the way the Dutch system is organised is not geared that well towards the implementation of care technologies. For instance, it is often unclear which party (state, municipality, health insurer etc.) should pay for a technology or a preventative measure, though in some areas progress has been made. There is also no agreement on how the savings that are thus made should be shared among the different parties. Whether a care technology is an effective and financially efficient way of providing good care is seen an important topic for research along with financial and organisational innovation.

With the general context that this provides we can now answer the question about the fit between the Dutch care framework and the care technologies.

While there is a reasonably good fit between the Dutch care framework and the care technologies that are being developed for older people, this does not mean that there are no significant problems with the implementation of care technologies in the Netherlands and to be sure the uptake of care technologies in the Netherlands is still relatively low. To understand this complexity, we need to understand Dutch care ideology as outlined above in section 1 as a principally neo-liberal care ideology (Esping-Andersen, 1990). In this care ideology innovation has a special place as a preferred solution to social problems (Harvey, 2005; Neven, 2011; Neven & Peine, 2017). Technological innovations such as those listed above are welcome as a means to improve care in the Netherlands. To give an example, ageing in place is for instance facilitated by technologies like Sensara, Medido, Mynlife, Yoom, Tessa and Compaan but ageing in place is also a key part of what is considered good ageing in the Netherlands. As such Dutch ideas about good care and innovation tend to fit quite well. The expert interviews however highlight that care technologies for older people in the Netherlands most definitely have their issues. Connecting with the identity and diversity of older people is still very difficult. The Dutch way of financing care makes

care innovation more difficult. Also, current technologies are very medically focused, with social problems being left under addressed. There is also a risk of introducing a new “eHealth divide” akin to the digital divides we already know of. Thus, despite the fit between policy and technology which you could see at first glance, there is still much work that needs to be done in the Netherlands to fully implement meaningful technologies for older people.

Indeed, the biggest problem lies in the discrepancy between governmental goals and the promises of designers and engineers on the one hand and the reality of relatively low uptake of technologies on the other hand. To be sure, there are successful technologies and the use of technologies for and by older people has improved over the last five years. But, apart from (first generation) care alarm systems, many care technologies for older people still have a relatively modest user base (and indeed many technologies have failed as a result).

This is noteworthy, particularly given the emphasis of the Dutch government on eHealth and other care innovations, given the amount of money spent by governments and businesses on developing care technologies for older people and given the length of time that has gone into developing and trying to implement care technologies for older people which is now spanning decades. This points to the fact that there are still very significant problems with the design, implementation and use of care technologies for older people which are holding back significant upscaling of these technologies. The interviews done with experts in the field of ageing and technology point to an overemphasis on the design of innovative technologies and not enough emphasis on the social, organisational, financial aspects of implementing such technologies in the everyday lives of older people. Moreover, there still seems to be a rather substantial mismatch between (the diversity of) the lives of older people and the technologies that are developed for them. Technologies only “work” if they have a meaningful place in the lives of older people and are reasonably embedded in social, financial and care systems. If we categorize this as the “hard” side of technical innovation versus the “soft” side of understanding meaningful implementation, then it seems we need to focus on the soft side.

So, in sum, while the Dutch framework of good care may be relatively well aligned with Dutch care innovations, this does not mean that these innovations are necessarily well aligned with the users, carers and organisational context in which they are supposed to function. It will take a considerable effort to achieve this.

5.4.4 References

- Anderiesen, H. (2017). *Playful Design for Activation: Co-designing serious games for people with moderate to severe dementia to reduce apathy*. PhD Thesis. TU Delft.
- Bruil, L., Adriaansen, M. J., Groothuis, J. W., & Bossema, E. R. (2018). Kwaliteit van leven van verpleeghuisbewoners met dementie voor, tijdens en na het spelen met de tovertafel. *Tijdschrift voor Gerontologie en Geriatrie*, 49(2), 72–80.

- Dam, A. E., Van Boxtel, M. P., Rozendaal, N., Verhey, F. R., & de Vugt, M. E. (2017). Development and feasibility of Inlife: a pilot study of an online social support intervention for informal caregivers of people with dementia. *PLoS One*, 12(9).
- Esping-Andersen, G. (1990). *The Three Worlds of Welfare Capitalism*. Cambridge Polity Press.
- Harvey, D. (2005). *A Brief History of Neoliberalism*. Oxford University Press.
- Hattink, B. J. J., Meiland, F. J., Overmars-Marx, T., De Boer, M. E., Jedlitschka, A., Ebben, P., Stalpers-Croeze, I., Flick, S., Van der Leeuw, J., Karkowski, I., & Dröes, R. M. (2016). The electronic, personalisable Rosetta system for dementia care: exploring the userfriendliness, usefulness and impact. *Disability & Rehabilitation: Disabil Rehabil Assist Technol.*, 11(1), 61–71.
<https://doi.org/10.3109/17483107.2014.932022>
- Jester Strategy (Ed.) (2019). *Technologie in de verpleeghuiszorg*. <https://jester.nl/wp-content/uploads/2016/03/Technologie-in-de-Verpleeghuiszorg.pdf>
- Jones C., Moyle W., Murfield J., Draper, B., Shum, D., Beattie, E., & Thalib, L. (2018). Does Cognitive Impairment and Agitation in Dementia Influence Intervention Effectiveness? Findings From a Cluster-Randomized-Controlled Trial With the Therapeutic Robot, PARO. *J Am Med Dir Assoc.* 19(7), 623–626. <https://doi.org/10.1016/j.jamda.2018.02.014>
- Karssemeijer, E., Aaronson, J., Bossers, W., Donderdag, R., Olde, M., & Kessels, R. (2019). The quest for synergy between physical exercise and cognitive stimulation via exergaming in people with dementia: a randomized controlled trial. *Alzheimers Research & Therapy*, 11–3.
- Lauritzen, J., Muñoz, A., Sevillano, J., & Civita, A. (2013). The Usefulness of Activity Trackers in Elderly with Reduced Mobility: A Case Study. *MEDINFO 2013*, <https://doi.org/10.3233/978-1-61499-289-9-759>
- Luyten, T., Braun, S., Van Hooren, S., & De Witte, L. (2018). How groups of nursing home residents respond to “the CRDL”: a pilot study. *Journal of Enabling Technologies*, 12-4, 145–154.
<https://doi.org/10.1108/JET-05-2018-0025>
- Marshall, B., & Katz, S. (2016) How old am I? Digital culture and quantified ageing. *Digital Culture and Society*, 2, 145–159.
- Meiland, F. J., Hattink, B. J. J., Overmars-Marx, T., De Boer, M. E., Jedlitschka, A., Ebben, P. W. G., Stalpers-Croeze, I. N. W., Flick, S., Van der Leeuw, J., Karkowski, I. P., & Dröes, R. M. (2014). Participation of end users in the design of assistive technology for people with mild to severe cognitive problems; the European Rosetta project. *International Psychogeriatrics*, 26(5), 769–779.
<https://doi.org/10.1017/S1041610214000088>
- Mervin, M.C., Moyle, W., Jones, C., Murfield, J., Draper, B., Beattie, E., Shum, D. H. K., O’Dwyer, S., & Thalib, L. (2018). The Cost-Effectiveness of Using PARO, a Therapeutic Robotic Seal, to Reduce Agitation and Medication Use in Dementia: Findings from a Cluster-Randomized Controlled Trial. *J Am Med Dir Assoc.* 19(7), 619–622.e1. <https://doi.org/10.1016/j.jamda.2017.10.008>

- Moyle, W., Jones, C., Murfield, J., Thalib, L., Beattie, E., Shum, D., O'Dwyer, S., Mervin, M. C., & Draper, B. (2017). Use of a Robotic Seal as a Therapeutic Tool to Improve Dementia Symptoms: A Cluster-Randomized Controlled Trial, *Journal of the American Medical Directors Association*, 18(9), 766–773.
- Moyle, W., Bramble, M., Jones, C., & Murfield, J. (2019). “She Had a Smile on Her Face as Wide as the Great Australian Bite”: A Qualitative Examination of Family Perceptions of a Therapeutic Robot and a Plush Toy, *The Gerontologist*, 59(1), 177–185. <https://doi.org/10.1093/geront/gnx180>
- Neven, L. (2011). Representations of the Old and Ageing in the Design of the New and Emerging. PhD Thesis. University of Twente.
- Neven, L. (2015). By Any Means? Questioning the Link Between Gerontechnological Innovation and Older People’s Wish to Live at Home. *Technological Forecasting and Social Change*. 93, 32–43.
- Neven, L., & Peine, A. (2017). From Triple Win to Triple Sin: How a Problematic Future Discourse is Shaping the Way People Age with Technology. *Societies*, 7–26.
- Schlomann, A. (2017). A case study on older adults’ long-term use of an activity tracker. *Gerontechnology*. 16(2), 115–124. <https://doi.org/10.4017/gt.2017.16.2.007.00>
- Schuiteman, J. (2017). The use of ICT to support informal caregiving - A systemic approach. Thesis Rapport, Wageningen University and research. https://www.uwcompaan.nl/media/Rapport_Schuiteman_2017.pdf
- Teunissen, L., Luyten, T., & De Witte, L. (2017). Reconnecting People with Dementia by using interactive instrument CRDL. In L. Cudd, L. de Witte, *Harnessing the power of technology to improve lives*, IOS Press.
- Ten Bruggencate, T. (2020). The Need to be Needed. An exploration of older people’s social needs, social technology and interventions. PhD Thesis, University of Tilburg.
- Van Santen, J., Dröes, R. M., Holstege, M., Henkemans, O. B., Van Rijn, A., De Vries, R., Van Straten, A. & Meiland, F. (2018). Effects of exergaming in people with dementia: results of a systematic literature review. *Journal of Alzheimer's Disease*, 63(2), 741–760. <https://dx.doi.org/10.3233%2FJAD-170667>
- Van Santen, J. Dröes, R. M., Twisk, J., Henkemans, O. B., Van Straten, A., & Meiland, F. (2020). Effects of Exergaming on Cognitive and Social Functioning of People with Dementia: A Randomized Controlled Trial. *Journal of the American Medical Directors Association*. <https://doi.org/10.1016/j.jamda.2020.04.018>

5.5 National report: Italy

Cecilia Tomassini

5.5.1 A brief introduction to the country

Demographic ageing, i.e. the transition of the age structure, characterized by an increasing proportion of older people and population decline, implies crucial challenges for societies. In 1951, the proportion of people aged 65 and over was around 12% in the UK, compared with only 8% in Italy. However, the demographic trends behind population ageing have been so rapid and so remarkable in Italy that nowadays it is among the “oldest” countries in the world. A rapid and intense decline in fertility, combined with impressive achievements in extending survival, especially at older ages, have helped put Italy among the countries in 2020 with the highest proportion of older people (23.1), the highest median age of the population (51.7) and the highest ageing index (178)¹⁶⁵. This trend is more significant in rural Italy than in metropolitan areas, where an outflow of young people is accelerating population ageing. As a result, remote areas are seeing rapid population ageing while lacking basic resources to cater for the needs of older people, such as hospitals, specialist doctors, pharmacies, general practitioners, public transport or a fast internet connection. The challenges of this rapid population ageing are therefore unique in Italy and require a detailed analysis of current care arrangements in order to plan adequate care services for the future.

Another important point to bear in mind when considering the older Italian population is its heterogeneity in terms of socio-economic characteristics. For example, compulsory education to age 14 was only introduced in 1962, so most very old people have five years of schooling or less; very old people used to work mainly in agriculture and their distribution in the Italian territory follows different patterns, as they are more present in smaller towns further inland. Additionally, those living in rural areas may lack potential informal carers since their children have moved to urban areas. This heterogeneity should be borne in mind when analysing various aspects of technology in care and the different impact that it could have among different groups of older people. For example, in 2017 the percentage of people using the web was 30.8% among those aged 65 and over, but only 8.8% among those aged 75 and over (ISTAT, 2018). Therefore, while new technologies are increasingly impacting the entire population, older people (especially the oldest old) may have difficulties in dealing with them since they lack the knowledge to use them, and do not perceive it as essential since they have lived without it for their entire life. At the same time, technology may be more useful to older people who lack informal carers (i.e. children) than to older parents. The significant heterogeneity that characterizes the

¹⁶⁵ <http://demo.istat.it/altridati/indicatori/index.html>

older Italian population should therefore suggest that there are no universal care approaches to support older people: differentiated tactics are required to deal with such processes.

Major strategies to ensure quality of care

In the Italian Constitution there are 4 chapters that refer to the principles that can drive care and social services. Article 2 states that the Republic shall recognise and protect the inviolable rights of the person, both as an individual and in the social groups where human personality is expressed. The Republic expects the fundamental duties of political, economic, and social solidarity to be fulfilled. Article 3 states that all citizens shall have equal social dignity and shall be equal before the law, without distinction of gender, race, language, religion, political opinion, personal and social conditions. It shall be the duty of the Republic to remove those obstacles of an economic or social nature which constrain the freedom and equality of citizens, thereby impeding the full development of the human person and the effective participation of all workers in the political, economic and social organisation of the country. Article 32 states that the Republic shall safeguard health as a fundamental right of the individual and as a collective interest and shall ensure free medical care to the indigent. No-one may be obliged to undergo any health treatment except under the provisions of the law. The law may not under any circumstances violate the limits imposed by respect for the human person. Finally, Article 38 states that every citizen unable to work and without the necessary means of subsistence shall be entitled to welfare support.

Social services are regulated by Law 328/2000, which states that the Republic provides individuals and families with an integrated system of interventions and social services; promotes actions to secure a good quality of life, equal opportunities, non-discrimination and citizenship rights; that it prevents, stops or reduces situations of disability, need, individual or family hardship that are caused by low income, social problems or dependency in line with Chapters 2, 3 and 38 of the Italian Constitution.

The constitutional principles are clear, but the organisation of care services for those in need had a difficult start. Since the late 1970s, the Italian welfare regime has organized care (including elder care) by distinguishing health from social care. This separation has created many difficulties with access and usage of services by the older population, for several reasons: the lack of financial and organisational integration of the providing authorities (the regions for health, the municipalities for social care), a traditional preference for monetary transfers that has indirectly promoted the development of a wide private care market, mainly on an undeclared basis, in the form of foreign migrants directly employed as live-in home care workers by older people's families. The employment of foreign migrants for care was spread among those with higher social status and those who were receiving monetary transfers from the welfare system.

The provision of social care – tax-funded and provided by municipalities on a means-tested basis – varies greatly across the country, both in terms of quality and quantity, depending on the traditions and financial resources of individual municipalities. According to the latest survey conducted by the Italian

Institute of Statistics in 2016¹⁶⁶, only 1.6% of people aged 65 and over have benefited from this kind of service, with strong differences between geographic areas. On the other hand, health districts coordinate the provision of Integrated Home Care Services (Assistenza Domiciliare Integrata: ADI), such as nursing and rehabilitation. Home healthcare services (i.e., excluding social care) are quite widespread, currently reaching about 6.4% of older people¹⁶⁷, but again with great variations among the Italian regions. Additionally, the number of hours provided is indeed low compared to other countries. In 2016, residential care funded by the health system (provided in nursing homes, rehabilitation, or post-acute facilities) hosted 2.1% of older people aged 65 and over (7.6% among those aged 85 and over) (ISTAT, 2018). Also, for older people living in institutions, the proportion varies greatly in different areas of the country.

The period 2000–2010 has been possibly the most expansive period for the diffusion of care services in Italy (NNA, 2017) according to data on use and the kind of services offered by local authorities. With the great recession, it was not only that the growth in the supply of services stopped: also, budget restrictions imposed at local level hit welfare policies harder than other areas of public expenditure. The current situation appears uncertain (NNA, 2017) since there is no clear political vision of how to deal with care. The COVID-19 crisis may herald a new phase in dealing with care since the whole system of support has to be rearranged, as shown in the next section.

As the NNA report underlines (NNA, 2017), a national reform of the care system in Italy was discussed in the 1990s, but disappeared from the political agenda in the subsequent decade without any serious action being taken. The main reason seems to be that the regions (which are responsible for healthcare) have traditionally been more interested in health services and only partially in socio-health services, post-discharge strategies and services for chronic diseases. On the other side, local authorities (which are responsible for social services) only offer marginal services to the older population and have witnessed a greater reduction in social expenditure in the last decade. National budget allocation is different indeed: in 2013, 9.1% of Italian GDP was spent on healthcare compared to 1.8% on long-term care, including the Care Allowance (European Commission, 2016).

The decrease in public expenditure for care services, along with the rapid ageing of the Italian population, has increased the burden of most elder care on family members, especially women, who are already caught between their own family duties and their jobs. The multiple roles of family members (worker, parent and carer), along with the fact that the prevalent source of public support is the Care Allowance, has induced families to employ private carers (often illegally) in the private market.

There is no strong statistical evidence in national surveys on what older people would prefer when in need of support. It is well known that older people prefer to “age in place”; to stay in their usual environment as long as possible (Piccinini, 2020). Home care, allowing them to stay in their home, is

¹⁶⁶ ISTAT Indagine Multiscopo sulle Famiglie e Soggetti Sociali, author’s calculations

¹⁶⁷ See footnote 163

therefore particularly welcomed. The major problem, though, seems to be in choosing the best strategy to allow older people to stay in place. A recent study (Arlotti, 2015) stresses how important it is for older people to have a “case manager” who supports them and their families from the first onset of limiting problems. Unfortunately, case managers have only been introduced in a few local settings.

Italy's approach to technologies in care

In the Italian framework, technology may play an interesting role, since it may represent a well-appreciated solution for those who suffer from minor or mild limitations. Technology may help what is known as “residenzialità leggera”: not receiving care services, not moving to an institution, but staying at home with some forms of ITC support. Therefore, it is not only that the general attitude towards technology in care seems to be of great interest; it may also represent an opportunity for both the industrial and the healthcare sector. Several “programs and incentives for private companies and research institutions have been started to stimulate the development of new effective care solutions/products for older persons experiencing difficulties related to their chronic illnesses (disease management), as well as for those actively ageing who require specific needs to maintain their health and wellbeing” (Lattanzio et al., 2014), but there are few data on how widespread they are among older people. For example, a recent survey conducted in 2018 on 146 Italian institutions for older people (35% response rate) found that 53% of them did not use any technology or device (Rotolo, 2018). Therefore, the idea of introducing technologies is appreciated, but there are strong barriers preventing their implementation and large-scale utilisation in the Italian context.

In addition to the usual barriers for using ICT solutions among older people (e.g. knowledge, acceptance, usability) there are structural factors behind the limited development of technologies in care in Italy.

- *Funding*: small municipalities or private firms may often be interested in supporting projects that may have an impact on societies and are therefore inclined to fund the start-up phase. However, a successful technology needs a large-scale implementation phase with consistent, prolonged resources: in this phase, if there is no agreement between the public sector (at national/regional level or with an aggregation of local authorities) and private companies, implementation becomes very difficult. A large-scale implementation improves the quality of a product, and a new technology needs to be pervasive to have a real impact on older people's lives, otherwise it remains an example of good practice for a few subjects living in limited areas. That is the reason why start-ups often fail to continue the implementation of their projects, or move elsewhere (often abroad).
- The other crucial factor behind the scarce use of care technologies in Italy is the *legal vacuum regarding who is responsible for using technology*, putting patients in hazardous situations. For example, let us suppose that a new technology is tested which analyses data on changes in some vital parameters for people with severe heart problems. The idea is that instead of spending their convalescence in hospitals, these patients could be sent home, monitored with specific devices that collect and store health information. Such solutions are better accepted by patients and their families and are less costly for the hospital. But if a major health problem occurs, who is legally responsible for it? If the patient had been in hospital, could the crisis have been prevented? Is the problem related

to the use of the device testing? In general, is responsibility and accountability in telemedicine equal to face-to-face controls? Currently, in Italy, there is no clear legal framework to deal with such problems, which makes implementation particularly difficult.

- Additionally, another important legal issue is connected to the *security of individual health data storage*, which has been a major problem in projects using, as an output, “changes” in normal behaviour (e.g. movements, ECG, food habits). The privacy regulator imposes strict security rules that make the test phase of projects particularly expensive and often not feasible.

5.5.2 Contribution of technologies to care on specific issues

Contribution of technologies during the COVID-19 pandemic

The present Conte II Government has a ministry dedicated to technological innovation and digitalisation that has several annual calls for projects and start-ups. During the COVID-19 pandemic, the Ministry of Innovation introduced a task force jointly with the Health Ministry to propose and evaluate technological solutions to face the social and health emergency caused by the pandemic¹⁶⁸. The task force mainly concentrated its work on electronic data collection and data analysis in line with the privacy norms and their use among different government institutions. This task force recognized how correctly managing and sharing data may help institutions offer more effective services for people and firms. Among the eight groups working in the task force, the fifth dealt with digital solutions to support home care both at the time and after COVID-19. In this respect, the Ministry opened a fast call for technologies to oppose the spread of the pandemic. Additionally, the ministry website¹⁶⁹ contains a list of projects and solutions for digital innovation in public administration.

Additionally, on 16 June 2020, the National Institute of Health released the results of a survey conducted among family members of COVID-19 patients in hospitals, asking about their needs during the pandemic (ISS, 2020). The primary need perceived by family members was to keep in touch with their relatives. In this respect, they felt that there was an urgent request for accessible Wi-Fi and charging stations for COVID-19 hospitals. Additionally, they suggested that a professional carer should be available at the hospital to provide information and to help severely disabled patients to use devices.

At the time of this report (June 2020), the situation is extremely uncertain: depending on budget allocation, different strategies for ICT solutions for care can be implemented.

Contribution of technologies to prevent social isolation and loneliness

MYSOLI

MySOLI¹⁷⁰ is an app that provides an opportunity to shape the daily lives of guests in institutions, their families and their professional carers. MySOLI aims to improve residents’ quality of life, facilitate

¹⁶⁸ <https://innovazione.gov.it/nasce-la-task-force-italiana-per-l-utilizzo-dei-dati-contro-l-emergenza-covid-19/>

¹⁶⁹ <https://innovazione.gov.it/>

¹⁷⁰ <https://www.mysoli.it/>

communication and fight loneliness and isolation by increasing the role of families in care for older people in institutions. Additionally, it improves the quality of relations between guests, family and institution carers. One function of MySOLI is a diary where the institution carer notes all the activities performed, the progress achieved in certain tasks and the resident's mood, enabling the family to be updated about their relative. The institution carers create and organize the resident's social network and can post texts, pictures, audio clips and videos. All the messages received from outside are collected in a gallery that the guest can easily access. The institution carers have a direct channel with the family, so every information exchange is immediately delivered. The MySOLI project, carried out in the Latium Region (the region of Rome) has been funded under the eHealth Life2020 call: the app is used in many institutions (around one hundred) in the area, so it is on the market. At the time of COVID-19, this app was crucial in keeping the institution residents and their families close to each other, since face-to-face visits were restricted.

LHF-CONNECT

LHF-Connect¹⁷¹ is a robot avatar for telepresence that is useful to connect patients in isolation with their relatives and/or doctors/healthcare professionals, via video calls. The robot is remotely operated by a volunteer who controls its movements and connection. Patient privacy is fully respected. Staff do need to approach patients to hand them the tablets. The robot can be easily sanitized to reduce the risk of contagion. The robot has already been tested by several hospitals in Northern Italy during the COVID-19 emergency. It can handle small objects and monitor the environment. It has limited costs (around €1,200) and uses popular technologies which are immediately available. It does not need advanced skills and is an open source project with free downloadable software.

COLLEGAMENTI

Another project similar to MySOLI and LHF-Connect is CollegaMENTI¹⁷², run by CBA Group active in collaboration with the University of Trento. The device has been tested in 6 institutions for older people.

Final remarks

The three devices described above are likely to improve residents' quality of life as they can improve their relationship with their family members through the institution personnel, with no restrictions. The strengths of the technology include its simplicity, the involvement of the guests as well as the families and carers, and its high impact in situations when mobility is restricted, such as the COVID-19 lockdown. Drawbacks include the fact that it is not useful for guests who suffer severe mental illnesses and requires strong motivation by all three parties involved in the process.

¹⁷¹ <https://www.iit.it/it/iit-vs-covid-19/lhf-connect>

¹⁷² <http://www.collega-menti.it/>

Contribution of technologies to mobility

WIISEL

WIISEL¹⁷³ (Wireless Insole for Independent and Safe Elderly Living) aims to collect and analyse gait data from real users and correlate parameters related to the risk of falls in older people. WIISEL is designed to prevent falls, which are a major health problem for older adults, since they have an immediate effect on mobility and long-term effects such as disability, fear of falling and loss of independence. It was co-funded by the European Commission (FP7-ICT) for 3 years, with a €3.9 million budget and 8 partners from 6 different countries. It includes one pair of insoles with sensors powered by a wireless charging station. The insoles are connected via a smartphone to a data analysis system which consists of a server, a web application and a standalone program. The pilot study examined 15 people aged 65 and over for three days, and the validation phase included 39 participants with a history of falls. The insoles' strengths include their high acceptance by users, since the technology is particularly user-friendly, and they perceived it as useful to prevent falls and monitor patients after discharge. It could be a valuable help for people who would otherwise be confined to their homes. Drawbacks may include the lack of privacy for participants and probably the high costs of the insoles. The project has ended, but no references are present on the Internet to its implementation on the market.

Contribution of technologies to personal hygiene

PROBOSCIS

A new European project PROBOSCIS¹⁷⁴ will develop a new generation of bioinspired robot manipulators which may represent an interesting device in manufacturing and the food industry, and in assistive robotic systems for older and disabled people, adapting to unexpected situations and performing a multitude of real-world grasping tasks. The project is funded by the European Commission as part of the Horizon 2020 FET (Future Emerging Technologies) programme (€3.5 million) and is coordinated by the IIT (Italian Institute of Technology) and the BioRobotics Institute of Scuola Superiore Sant'Anna. Robotic manipulators are capable of reaching, sensing, grasping and manipulating different objects and releasing them into the environment, and can be operated in dry and wet settings: this feature may help older people with severe disabilities to perform personal hygiene actions. New generations of manipulators could be used in healthcare with functions such as lifting an older or disabled person, or handing them a tool or food. This project has just started, so no information is available on the implementation and the operationalisation. It has potential for those who have limbs with limited flexibility to perform complex actions, enabling them to stay in their own home.

¹⁷³ <http://www.wiisel.eu/>

¹⁷⁴ About PROBOSCIS

MAMACLEAN, LAVADI, SUITY

There are several apps that cover a vast territory (especially in Northern Italy) offering online laundry services. These apps (e.g. Mamaclean, Lavadi, Suitu¹⁷⁵) are not specifically targeted at older people, but at the general population. They have been operating in the last five years and have received funds from different public and private institutions. They are extremely easy to use, and offer a very quick service. Their major strengths are indeed their simplicity and efficiency and the possibility to pay both by credit card and cash. It could be useful for older spouseless men given the rigidly gendered division of household chores in past generations. Their major weaknesses are that they need a smartphone to operate, they can be costly, and they mainly work in major cities in selected areas of the country and therefore exclude older people living in remote areas.

Contribution of technologies to nutrition management

CHEFMYSELF

ChefMySelf¹⁷⁶ project aims to develop an ICT service to help older people prepare meals and maintain healthy eating habits. It includes a food processor targeted at older people which follows their nutrition requirements, and a social network focused on healthy ageing and eating. According to the developers, ChefMySelf is a tool to motivate older people to be active and to maintain existing social relationships while also creating new ones. The food processor is embedded with technology that allows older people to communicate with medical staff or other users in their social network using a tablet interface or a television. Through this device, older people are continuously assisted in cooking recipes, taking into account the nutritional requirements, within a social network (medical staff, caregivers, other users). The software also helps older people make a shopping list and can even be connected with a scale. ChefMySelf was funded under the 5th EU-AAL call and started in 2013. At present, it is on the market, distributed by Meteda (an Italian firm that designs and develops software and hardware devices in the field of medicine), but no information could be found on the number of users. Other projects from Meteda deal with nutrition, but they have a more general target population. The strengths of ChefMySelf may include the fact that is an especially useful tool for older men who are spouseless, due to the well-known gender differences in doing household chores in past generations. Another important point is that a television can be employed by low-tech users. During the pandemic, ChefMySelf could have been a useful tool to help older people with their shopping and for family members to monitor the eating habits of their older relatives. One important weakness is that an external volunteer must always be present to help older people who are connected.

¹⁷⁵ <https://www.mamaclean.it/>; <https://suityapp.com/>

¹⁷⁶ <http://www.aal-europe.eu/projects/chefmyself/>

Contribution of technologies to cognitive and communication skills

VR DEVICES

Virtual Reality (VR) is a new frontier in rehabilitation programmes since it can provide new, effective therapeutic tools to improve cognitive and functional abilities in a wide variety of rehabilitation patients, offering several features such as goal-oriented tasks and repetition (Bevilacqua et al., 2019). VR creates artificial environments with the possibility of patient interaction. It is considered a new frontier for neurological patients with symptoms such as poor attention, memory, problem-solving and executive dysfunctions. Some evidence of its benefits is provided by clinical trials involving a group of patients trained with the VR system versus a control group trained with traditional physiotherapy (Bevilacqua et al., 2019).

MAGIC-GLASS

Among VR devices, MAGIC-GLASS¹⁷⁷ targets stroke rehabilitation. Using a platform, the patient can perform rehabilitation at home through a set of adaptive games remotely monitored by clinical staff, as well as providing communication features. A set of games with different levels of difficulty improve the patient's performance and stimulate physical and cognitive rehabilitation in the immersive environment of virtual reality. MAGIC-GLASS is on the market. It was financed by the European Union's Horizon 2020 Research and Innovation Programme (grant agreements 687228 and 691556) and it is a joint venture between Italy, the United Kingdom and Sweden. The strength of MAGIC-GLASS, like all VR devices, lies in the fact that it can be used in the comfort of people's home and does not require technical skills. Older people do not need to go to hospital for rehabilitation programmes, which could have been particularly useful during the COVID-19 pandemic.

Contribution of technologies to personal safety and security

WIMHOME and WIMDOOR

The WiMHome and WiMDoor¹⁷⁸ systems have been developed by the province of Trento with the support of the EU Regional Development programme. The WiMHome wireless system continuously monitors the domestic environment, generating feedback about the regular activity of older people living alone and reporting any changes in normal behaviour, such as falls or leaving their bed or apartment. Additionally, an alarm (for smoke, flooding, falls) sends a message to a family or formal carer via a phone call. The WiMDoor system deals with the risk of older people escaping from controlled spaces and can be used in private homes as well as in institutions for older people. The system sends an alarm when a monitored person is near or passes along a specific route. Both systems are on the market and mainly serve the province of Trento, but the number of users is not specified. The strength of both

¹⁷⁷ <https://www.tech4care.it/magic-glass/>

¹⁷⁸ <https://www.wimonitor.it/wimonitor/it/>

systems is their practical feasibility and possibly their acceptance. One drawback could be that older people's privacy is not respected.

SENSOR-CARE

Similarly to the previous system, Sensor-Care by Neuranix¹⁷⁹ provides 24/7 monitoring of older people at home without cameras or microphones. Sensors pick up potential unusual situations such as changes in their eating habits, personal hygiene or sleep/wake cycle, or irregularity in their daily activities. Sensors send updated information by text message or email. Additional sensors may be applied to detect gas, smoke or water leaks. This technology is on the market at a reasonable price. Unlike other devices for checking on older people at home, the absence of cameras respects the older people's privacy in their homes.

Contribution of technologies to high-need care for high dependence

UP-TECH

The main aims of the UP-TECH¹⁸⁰ project was to reduce the burden of family carers for Alzheimer's (AD) patients, and to keep AD patients in their own home. The project involved 450 AD patients and their carers, divided into three groups. One group received regular visits from health operators, one group received regular visits from health operators and assistive technology, and the third group was a control group. The UP-TECH assistive technology includes sensors that monitor the movements of the AD patients and interactive whiteboards with cognitive exercises to stimulate AD patients. Additionally, and this is probably the most interesting feature, the project aimed to ensure continuity of care and the integration of care pathways to help both patients and caregivers with a cost-effectiveness evaluation of the support received. In this respect, UP-TECH deals with one of the main concerns expressed by older people and their carers (Arlotti, 2015): having continuity in care and a dedicated health operator to provide information and support in association with ICT devices.

ANCELIA

Another interesting device is Ancelia¹⁸¹ (by TeiaCare), an operating system designed for nursing homes, powered by artificial intelligence, that aims to increase care processes' transparency and efficiency for management, carers and residents' relatives. Ancelia has adapted its software at the time of the pandemic to provide tools to prevent and limit the spread of COVID-19 inside the facility. In this respect, Ancelia was able to track staff movements and the assistance provided in specific areas; to reduce contact between carers and residents and the frequency of room access, and to help schedule shifts to avoid burn-out episodes by carers during an emergency. All these tasks are performed with the help of optical

¹⁷⁹ <https://www.sensor-care.com/>

¹⁸⁰ <http://uptech.regione.marche.it/>

¹⁸¹ <https://teiacare.com/>

sensors, positioned on the ceiling above the resident's bed. They do not require specific sanitization procedures.

Both projects' strengths lie in trying to ease up heavy care burden situations such as support to Alzheimer's patients and confined older people while respecting the dignity of older people.

Contribution of technologies to life and care planning in the context of uncertainty

HUNOVA

There are some technologies that aim to prevent major health problems among older people by trying to assess the risk of a certain detrimental event. For example, falls are one of the major health risks for older people. Hunova¹⁸² is a robot developed by the Galliera hospitals in Genova which assesses the risk of falls among older people by calculating a predictive and preventive indicator known as the Silver Index. Through exercises, the robot simulates the risk elements at the origin of falls in a controlled way, highlighting the person's specific deficiencies and suggesting a personalized rehabilitative intervention. The test is based on an algorithm which, through a robotic evaluation, summarizes and improves the clinical scales, resulting in an objective and personalized evaluation of the risk of falls. Once the percentage of the risk of falls is obtained, the silver index suggests the best preventive strategy, focusing on treatments in those areas where the robotic evaluation has found a deficit. This technology has already evaluated and treated over 5,000 patients in hospitals. Hunova strongly positive points include its high accuracy in predicting the risk of falls and the fact that the evaluation lasts only twenty minutes. According to the provider, it is well accepted by the users, since the assessment through exercises is entertaining. Hunova is already on the market.

Contribution of technologies to digital literacy

ACCESS

ACCESS¹⁸³ is a project dedicated to digital literacy: it provides learning opportunities for older persons with low technical skills to enable them to get in touch with and use modern technology. The main research objectives are to create learning opportunities even for older people living in remote areas or with low IT skills and generate learning programmes for health literacy. The project also aims to start discussions and exchanges of experience among users and stakeholders who are involved in supporting and counselling older people in their daily lives. ACCESS is a research project funded by the Joint Programming Initiative (JPI) "More Years, Better Lives – The Potential and Challenges of Demographic Change" and involves Italy, Finland, Germany and Austria. One strength of this project is that it tackles the problem of low skills among older people and offers an opportunity for them to rate different means of training. The multinational dimension may also consider different cultural and political settings. The results are expected at the end of the project.

¹⁸² <https://www.movendo.technology/en/hunova/>

¹⁸³ <https://access.wineme.fb5.uni-siegen.de/it/start-3/>

Contribution of technologies to accessing care of any type

INFORMCARE

InformCare¹⁸⁴ – the EU Information Hub on Informal Care – originated in two projects funded under the 7th EU framework that collected information and advice about caregiving activities in different national languages, as well as useful contacts and interactive tools to communicate with other peers, exchange experiences and provide mutual support. All the information in Italian was gathered by the INRCA (National Institute of Health and Science on Ageing). The site provides information according to the needs and preferences of the cared-for and the carer. Sadly, the website has not been updated in the last five years. Another project, ENTWINE, is currently investigating how it should be updated, via a cross-national survey¹⁸⁵.

Websites such those described above are extremely useful for people who want quick and easy access to a multitude of information and training courses. The risk of these kind of websites is that sometimes it is hard to find the data needed and they have to be kept updated to be really useful.

Contribution of technologies to carer skills formal and informal

ASPASIA

Sponsored by Anziani e Non Solo (a social company that works on developing and achieving interventions, devices and services for and social inclusion), the websites *Aspasia*¹⁸⁶ and *Inform@anziani.it*¹⁸⁷ offer information and training on different topics, for both carers and clients. Anziani e Non Solo offers services of training for carers such as *E-Lily*¹⁸⁸ and *Dementoring*¹⁸⁹, designed for caregivers for people with dementia, helping them to use the Internet, providing skills and knowledge, especially in understanding medical information. These courses are generally free of charge and target people who have only attended compulsory schooling: both these characteristics point strongly to a need for easy and immediate information about caring.

Contribution of technologies to give voice to those who receive care

ROBOT ERA

The main aim of the Robot-Era project¹⁹⁰ (funded under the EU's 7th FP and involving Italy, Sweden, the UK and Germany) was to develop, implement and demonstrate the practicability, effectiveness and acceptability among real users of advanced robotic services, in real conditions to favour independent

¹⁸⁴ <https://informcare.eu/>

¹⁸⁵ <https://entwine-itn.eu/research/overview-work-packages/esr-11/>

¹⁸⁶ <http://equalaspasia.it/platform/>

¹⁸⁷ <http://www.informanziani.it/>

¹⁸⁸ <https://elily.eu/>

¹⁸⁹ <https://www.dementoring.eu/>

¹⁹⁰ <http://www.robot-era.eu/robotera/>

living and improve the quality of life and the efficiency of care for elderly people. The domestic robot DORO provided support to older individuals with its integrated robotic arm for manipulating objects, its tray for transporting objects, and its handle to provide walking support. The CORO robot worked in the condominium environment and can navigate between floors using the elevator. The ORO robot helped with transportation in an urban setting and it included a container to carry objects. The Italian team in the Robot-Era system analysed the acceptance of robotics as potential solutions for older people with a disability living alone in their homes. Their experiment involved 45 older adults extensively interacting directly with the three cooperating robots described above. Since acceptance depends on feelings of familiarity, on perceived robustness, on the perception that what they do is functional and on general disposition, the project specifically targeted these aspects. They found that appearance is a significant aspect for acceptance, as well as previous familiarity with computers and other electronic devices. Acceptance was also driven by a feeling of safety and the idea of relieving the burden of care for children. This project's main achievement was to identify what is needed to make new technologies more accepted by the users through an experimental design and questionnaire. The sample size was limited, but adequate for this kind of experiment (Cavallo et al., 2018).

5.5.3 Summary

There is a lot of potential in the development of technology in Italy since it could represent an important partnership between the public and private sector in the context of an ageing population. Given the general preference of both older people and their families to stay at home, technology may help both groups to reach this goal since it provides them with a reliable means of support that can facilitate daily life tasks. Additionally, given the growing number of older people, accompanied by a smaller pool of potential carers (due to fifty years of declining fertility), the competing risks for adults divided between work, family and care, and the presence of limiting illnesses, investing in technology seems to be a winning strategy. In addition to the devices, a solid training effort must be implemented for the generations of very old people that have a strong lack of digital skills compared to younger cohorts. For such cohorts, it may be simpler to use traditional devices (e.g. TVs) that may be more familiar to the oldest old or to those living in areas which are not connected. Digital training should also be carried out for professional and family carers. On the epidemiological side, the application of telemedicine is complex due to the legal framework, which is still not clearly defined in terms of responsibility, accountability and security.

Lacking a national strategy for the use of technology in care, the regions (which are responsible for healthcare in Italy) may have different attitudes and funding strategies. This means there is a high probability of the patchwork dissemination of new technologies in the Italian territory. Therefore, Italy should implement a clear vision at national level on the importance of new technologies and their impact on an ageing population: funding large scale projects is not a current expenditure, but a clever investment which reduces care costs in the future.

5.5.4 References

- Arlotti, M. (2015). Bisogni e cura familiare: un'indagine esplorativa. In M. Arlotti, L. Catena, A. Genova (a cura di), *La dimensione territoriale dell'integrazione*, Roma, Carocci, 101–116.
- Barbabella, F., Poli, A., Hanson, E., Andréasson, F., Salzmann, B., Döhner, H., Papa, R., Efthymiou, A., Valenza, S., Pelliccioni, G., & Lamura, G. (2018). Usage and Usability of a Web-based Program for Family Caregivers of Older People in Three European Countries: A Mixed-Methods Evaluation *Comput Inform Nurs.* 2018; 36(5), 232–241. <https://doi.org/10.1097/CIN.0000000000000422>
- Bevilacqua, R., Maranesi, E., Riccardi, G.R., Di Donna, V., Pelliccioni, P., Luzi, R., Lattanzio, F., & Pelliccioni, G. (2019). Non-Immersive Virtual Reality for Rehabilitation of the Older People: A Systematic Review into Efficacy and Effectiveness. *J. Clin. Med.* 2019, 8, 1882.
- Birtha, M., Rodrigues, R., Zólyomi, E., Sandu, V., & Schulmann, K. (2019). From disability rights towards a rights-based approach to long-term care in Europe: Building an index of rights-based policies for older people. European Centre for Social Welfare Policy and Research.
- Cavallo, F., Esposito, R., Limosani, R., Manzi, A., Bevilacqua, R., Felici, E., Di Nuovo, A., Cangelosi, A., Lattanzio, F., & Dario, P. (2018). Robotic Services Acceptance in Smart Environments With Older Adults: User Satisfaction and Acceptability Study *J Med Internet Res* 2018; 20(9):e264. <https://doi.org/10.2196/jmir.9460>
- European Commission (2016). Italy – Country Report. Joint Report on Health Care and Long-Term Care Systems & Fiscal Sustainability. Institutional Paper 37 Volume 2.
- Ferré, F., De Belvis, A.G., Valerio, L., Longhi, S., Lazzari, A., Fattore, G., Ricciardi, W., & Maresso, A. (2014). Italy Health system review, The European Observatory on Health Systems and Policies.
- ISS (2020). Psychological support and more contacts with health professionals: ISS survey on the needs of family members of patients admitted to COVID-19 wards. https://www.iss.it/web/guest/primo-piano/-/asset_publisher/o4oGR9qmvUz9/content/id/5421582
- ISTAT (2018). I presidi residenziali socio-assistenziali e socio-sanitari Report.
- Lattanzio, F., Abbatecola, A. M., Bevilacqua, R., Chiatti, C., Corsonello, A., Rossi, L., Bustacchini, S., & Bernabei, R. (2014). Advanced Technology Care Innovation for Older People in Italy: Necessity and Opportunity to Promote Health and Wellbeing *Journal of the American Medical Directors Association*, Volume 15, Issue 7, 457–466.
- Network Non Autosufficienza – NNA (2017). *L'assistenza agli anziani non autosufficienti in Italia 6° rapporto 2017/2018*, Maggioli Editore.
- Papa, R., Efthymiou, A., Lamura, G., Piccinini, F., Onorati, G., Papastavrou, E., Tsitsi, T., Boccaletti, L., Manattini, A., Seneca, R., Casu, G., Vaz de Carvalho, C., Durão, R., Barbabella, F., Andréasson, F., Magnusson, L., & Hanson, E. (2020). Review and selection of online resources for carers of frail adults or older people in five European countries: a mixed-methods study. <https://doi.org/10.2196/14618>

- Piccinini, F., Gagliardi, C., Lamura, G., & Fabbietti, P. (2020). L'assistenza alle persone anziane non autosufficienti nella Regione Marche: il punto di vista degli interessati e delle loro famiglie. IRCCS INRCA Centro Studi e Ricerche Economico-Sociali per l'invecchiamento Ancona.
<https://www.inrca.it/inrca/files/Marzio/Documenti/INRCA%20-%20Report%20sulla%20popolazione%20anziana%20non%20autosufficiente%20nella%20Regione%20Marche%20-%20Aprile%202020.pdf>
- Rotolo, A. (2017). Prospettive per il settore sociosanitario: dal presente al futuro, l'evoluzione della cura agli anziani, presentazione Cergas 17 settembre 2018.
- Spinsante, S., Stara, V., Felici, E., Montanini, L., Raffaelli, L., Rossi, L., & Gambi, E. (2017). The Human Factor in the Design of Successful Ambient Assisted Living Technologies. In C. Dobre, C. Mavromoustakis, N. Garcia, R. Goleva, & G. Mastorakis (Eds.), *Ambient Assisted Living and Enhanced Living Environments*, Butterworth-Heinemann, 61–89.
- Stara, V., Harte, R., De Rosa, M., Glynne, L., Caseye, M., Hayese, P., Rossia, L., Mirelmanf, A., Bakerg, P., Quinlan, L., & ÓLaighin, G. (2018). Does culture affect usability? A trans-European usability and user experience assessment of a falls-risk connected health system following a user-centred design methodology carried out in a single European country *Maturitas* 114 (2018) 22–26.

5.6 National report: Sweden

Johanna Ulfvarson

5.6.1 A brief introduction to the country

Healthcare in Sweden is largely tax-funded, a system that ensures everyone has equal access to healthcare services. The population of Sweden as of January 2020 was 10,333,456. In 2019, Sweden's population increased by 97,404 people, 94% of whom had a foreign background while the remaining 6% had a Swedish background. Sweden is divided into 290 municipalities and 21 regional councils. Swedish healthcare is decentralized – responsibility lies with the regional councils and, in some cases, local councils or municipal governments. This is regulated by the Health and Medical Service Act. The role of the central government is to establish principles and guidelines, and to set the political agenda for health and medical care. Regional councils are political bodies whose representatives are elected by the region's residents every four years on the same day as the national general election. In 2018, health and medical care comprised 10.9% of GDP. The general government financed 85% of the total costs, while households paid 14% of the total costs via patient fees and other fees. Health and medical care costs can be classified into seven main areas. Curative and rehabilitative care account for over half of all the costs. Health and medical care for the elderly and persons with disabilities accounts for a quarter of the health and medical care sector. Nursing costs are also included in these costs. The third largest item is the cost of pharmaceuticals for outpatients. As in many other developed countries, people in Sweden are living longer and longer. The average life span is now 84 years for women and 81 years for men. This can be attributed in part to falling mortality rates from heart attacks and strokes. About one in five people is 65 or older. That means that proportionally, Sweden has one of Europe's largest elderly populations. On the other hand, the number of children born in Sweden has been increasing nearly every year since the late 1990s. The ageing population puts pressure on Sweden's healthcare system.

Major strategies to ensure quality of care

The Swedish healthcare system is under pressure, with a population that is getting older as well as new medical possibilities to provide care for diagnoses that were once untreatable. The healthcare system is simultaneously undergoing a series of changes driven by rising demands and emerging needs. Citizens are at the centre of this change, having raised expectations on how healthcare should be delivered in an increasingly digitalized world.

Swedish policy states that every regional council must provide residents with good-quality health and medical care, and work to promote good health for the entire population. As of 2019, regional councils also cover dental care costs for residents up to the age of 23. Dental care from the age of 24 is subsidized by the state. Regional councils also must provide subsidized dental care support to the frailest citizens in Sweden. In connection with illness and disability, the risk of oral damage increases. The goal of dental

support is to increase the well-being and improve the quality of life of the elderly and disabled. The person has the right to choose which dentist will perform the necessary dental care.

Sweden's municipalities are responsible for care for the elderly in their own home or in special accommodation. Their duties also include caring for people with physical disabilities or psychological disorders and providing support and services for people released from hospital, as well as school healthcare. Medical doctors (MDs) in the public sector are employed by the county councils. Medical doctors cannot be employed by the municipalities. Caregiving in municipalities (e.g. care for older persons) is provided by registered nurses (RNs). The chief nurse in a municipality is the "medically responsible RN" (MAS). The MAS has the right to request assistance from an MD if needed. An MD can act as a "GP" if needed.

Sweden's disability policy: Around 10–20% of people in the Western world have a disability of some kind. The overarching goal of the Swedish government's disability policy is to give people with disabilities a greater chance of participating in society on the same terms as others. "Design for all" is one of the guiding principles in Sweden's accessibility work. General inaccessibility means that people with functional disabilities do not have the same opportunities as others to participate in community life. The Swedish government is working to overcome this problem in various ways. If society is designed for all, it is also accessible to all. Overall responsibility for improving accessibility is divided between different levels of government and public agencies. The Swedish government and parliament establish guidelines for disability policies, mainly through legislation. Government agencies have a national responsibility for specific sectors, including education, healthcare and employment. The county councils are responsible for health and medical care. The 290 Swedish municipalities are responsible for education and social services, among other things.

Housing: There are strict accessibility regulations in the Planning and Building Act and the Planning and Building Ordinance, aiming to enable as many people as possible to participate in society on equal terms. If people with disabilities need to have their accommodation modified to fit their specific needs, they have the right to apply for a grant from their local council/municipality.

Transport: Having the possibility to travel without hindrance is of vital importance to people with disabilities. All citizens must be able to work, study and take part in community activities on equal terms. To this end, the Swedish government has instructed the country's municipalities to initiate moves to make facilities such as bus and tram stops more accessible, which is all part of the Public Transportation Act. People with a permanent disability who have great difficulty travelling or using public transport can receive a car allowance from the Swedish Social Insurance Agency. This also applies to parents of children with functional impairments.

Sweden's approach to technologies in care

Digitization offers opportunities for future social services and health and medical care. Modern information and communication technologies may make it easier for individuals to be involved in their

own health and social care, support contact between individuals and service providers, and provide more efficient support systems for staff employed by service providers.

The government and the Swedish Association of Local Authorities and Regions want to support efforts to make use of the opportunities of digitization in social services and healthcare. To achieve this, they have endorsed a common vision for eHealth up to 2025. In 2025, Sweden aims to be the best in the world at using the opportunities offered by digitization and eHealth to make it easier for people to achieve good, equal health and welfare, and to develop and strengthen their own resources for increased independence and participation in society.

Many activities are under way at various levels related to digitization and eHealth, and it is important that various actors work together to make better use of the potential available in eHealth in the long and short terms. An integrated vision for eHealth can help create equitable, gender-equal and efficient healthcare and social services that are also user-friendly, accessible, and safe for individuals.

Digital strategy: The public sector mostly communicates via digital channels. New tools may give people with disabilities a greater degree of independence. Special emphasis is therefore being placed on digital inclusion in Sweden's national digital strategy¹⁹¹. The vision is of a sustainable digitized Sweden, where Sweden will be the best in the world in using the opportunities offered by digitization. Digitally competent and confident people can drive innovation; here, purposeful management and infrastructure are important conditions. To reach the overall goal, five sub-goals are set for digital competence, digital security, digital innovation, digital management and digital infrastructure. The sub-goals explain how digitization should be able to contribute to a positive development. This also helps to achieve the government's goal of Sweden having Europe's lowest unemployment rate by 2020.

EHealth vision for 2025: Sweden aims to be the best in the world at using digitalisation and eHealth to enable people to achieve good, equal health and welfare, as well as developing and strengthening their own resources for increased independence and participation in social life. The Swedish strategy¹⁹² (2020–2022) for the implementation of the 2025 eHealth Vision determines how the joint work between the state and Swedish Association of Local Authorities and Regions (SALAR¹⁹³) should be designed, partly to identify a number of focus goals within which specific efforts should be made to achieve the vision. The strategy should guide not only the joint work, but also the efforts the parties make individually. Regional or local actors or other businesses in the field of eHealth who want guidance in their own digitization work should also be able to use the strategy as a starting point. The strategy sets the strategic direction for the work, with four elements. These are 1) The individual as a co-creator, 2) Correct information and knowledge, 3) Safe and secure information management and 4) Development and digital transformation in collaboration.

¹⁹¹ För ett hållbart digitaliserat Sverige - en digitaliseringsstrategi (For a sustainable digitalised Sweden - a digitalisation strategy)

¹⁹² Strategi för genomförande av Vision e-hälsa 2025 2020-2022 (Strategy for implementing Vision e-health 2025 2020-2022)

¹⁹³ Swedish Association of Local Authorities and Regions

5.6.2 Contribution of technologies to care on specific issues

Contribution of technologies during the COVID-19 pandemic

Compared to other Scandinavian nations, Sweden has experienced a much higher number of COVID-19 deaths despite having a population only twice as high as either of those nations. However, Sweden has a larger proportion of people over 65 than other countries, as well as more persons aged over 85. A large proportion of deaths worldwide have occurred among older people living in nursing homes. Sweden is no exception, with a comparable proportion making up around half of all deaths. The elderly, frail individuals living in nursing homes are among the most vulnerable, with the highest risk of dying of COVID-19. Despite that, we can see that almost two-thirds of those infected are still alive, with a majority recovering fully after receiving treatment at the nursing home.¹⁹⁴

Sweden also has a comparatively high number of immigrants in confirmed high-risk groups and a lower number of registered nurses working in homecare and in municipalities. During spring 2020, Sweden chose to close its universities and gymnasias (high schools), and all education became remote, digital or with home exercises. In March, the government announced that the ban on public gatherings would be extended to include all gatherings of more than 50 people, to further decrease the spread of the infection, again at the request of the Public Health Agency. Additionally, digital meetings were recommended, and everyone was encouraged to avoid travelling within the country. Overall, travel from the Stockholm region decreased by 80–90%.

Sweden already had well developed digital healthcare resources, with video consultation as an option, but because of COVID-19 the use of and demand for such services has risen tremendously. Individuals can book a meeting with a physician online, get a confirmation with a link to a video meeting and, if needed, get a prescription online and have it delivered to their homes.¹⁹⁵

Several national authorities and other stakeholders have joined forces to develop a site to support the digitization of care, healthcare and social services within the municipalities in Sweden. The site [Digitalvardochomsorg.se](https://www.digitalvardochomsorg.se)¹⁹⁶ helps the municipalities to make the change to digital care because of COVID-19, by providing links to the specific materials (old and new) of the collaborators that have been collected and created to meet the new challenge. Here, compilations and experiences, research and relevant knowledge are published.

Education is another area that has seen a digital upswing this spring, with digital classrooms and video conferences instead of traditional teaching. Students in healthcare have had to do simple practice on relatives and will do the proper vocational training later.

¹⁹⁴ Närmare två tredjedelar av covid-sjuka på SÄBO överlever (Nearly two thirds of covid patients at SÄBO survive)

¹⁹⁵ <https://www.camano.com/sv/pa-spaning-digital-ward/>

¹⁹⁶ <https://www.digitalvardochomsorg.se/>

Since the Swedes are an increasingly digitized people, the pandemic has of course affected everybody, and mostly the elderly forced into social isolation. However, even in the oldest group, 76 years and up, more than half are internet users. Among those aged 16–25, there is 100% use of smartphones, music via the internet, online videos and chat services. Increasing numbers have fibre broadband at home, and the use of broadband-dependent services, such as watching films and participating in video chats, has increased¹⁹⁷.

FAMILJEHEMSWEDEN E-SERVICE

FamiljehemSweden¹⁹⁸ is a national e-service via which people who would like to provide a foster home for children and young people can apply. The service has been developed by the Swedish Association of Local Authorities and Regions (SALAR). This provides for children and young people who, for various reasons, are unable to live with their parents. Some have fled from war and arrived in Sweden without their parents. Whether for a long time or just a brief period, it is important that these children stay with a safe and stable family. FamiljehemSweden have developed a secure video meeting system. Municipalities connected to FamiljehemSweden can use the Secure Video Meetings service¹⁹⁹ for that purpose. The service is designed for social services in municipalities and is intended to facilitate recruitment at foster homes as well as distance communication where sensitive information is shared. Secure video meetings can be used both on computers (in Chrome and Firefox browsers) and on mobile phones (iOS and Android).

INERA

Inera²⁰⁰ is a company owned by regions, municipalities and SALAR. The mission is to create the conditions for digitizing welfare, by providing the owners with a common digital infrastructure and architecture. Inera must always work for the good of the inhabitants. Inera has just released “Digital meeting” a service for secure video and remote meetings, specially developed to create greater benefits for municipalities, as it makes it easier and safer to use digital meetings. All that is needed is basically Internet access and a computer, tablet, or mobile phone.

SKOLA HEMMA

Skola Hemma²⁰¹ is a service helping schools to deal with the consequences of the COVID-19 pandemic. The site is maintained by the RISE research institute in collaboration with the following partners: The Swedish National Agency for Education, SALAR, Swedish Edtech Industry, UR, the School Research Institute, the Special Education School Authority, Save the Children, the Gothenburg Region, the Prince Couple’s Foundation and the Swedish University of Applied Sciences.

¹⁹⁷ The Swedes and the Internet 2017 – Summary

¹⁹⁸ <https://www.uppdragpsyiskhalsa.se/e-tjansten-familjehemsverige/>

¹⁹⁹ <https://www.uppdragpsyiskhalsa.se/e-tjansten-familjehemsverige/sakra-videomoten/>

²⁰⁰ <https://www.inera.se/tjanster/video--och-distansmote/digitalt-mote/>

²⁰¹ <https://www.skolahemma.se/>

Contribution of technologies to social isolation and loneliness and behavioural and psychological issues

MIMERSE

Roughly one in four people develop a mental health disorder at some point in their lives, but two-thirds of them never receive treatment. Mimerse²⁰² aims to make mental healthcare available to everyone, everywhere, through virtual reality experiences. It is just one of over 60 VR/AR companies in Sweden, many of which are in the healthcare industry. Mimerse's self-help app helps patients manage and treat their mental health disorders, while also preventing them from worsening by allowing patients to work through a series of experiences. Older people are not a homogeneous group; ageing is very individual. A person may have suffered from mental ill health or illness early in life and aged with it, or may be affected later in life due to various losses with increasing age. Several studies have recently cited involuntary loneliness as a risk factor for mental illness. Having significant relationships is important at all ages – partly to live a meaningful life and partly to stay healthy. The proportion of people aged 85 years and older who have a close friend increased from 63% to 72% between 2008 and 2017. Any partner is not counted. However, people aged 85+ are still more likely than younger people to live alone and not to have a close friend they can talk to.

NYBY

The Nyby²⁰³ app allows people to connect digitally to help each other. The app is free to download and easy to use. Users sign up for an account using their smartphone and join the geographical group with which they feel the greatest affiliation. Then it is easy to both register something they need help with, and respond to other people's requests for help. When someone answers, they start a chat where the user and the other helper themselves agree on what will be done, where and when.

TELEPHONE KIOSK

The Swedish company Telia²⁰⁴, together with the municipalities of Mörbylånga and Trelleborg, aims to support social contact in spite of physical isolation. Through a pilot project, residents of elderly homes now have access to new technology. Because new technology can be perceived as complicated, it is accessed in a familiar format – a telephone kiosk. A large Swedish study on digital communication tools showed that they had a particularly positive impact on the elderly in terms of depression, physical health, isolation, human support and interaction with others. In contrast, the investigators found no systematic reviews of how quality of life or well-being and thinking ability are affected. Social media, apps and

²⁰² <https://mimerse.com/>

²⁰³ Engagera dig eller be om hjälp med appen Nyby (Get involved or ask for help with the Nyby app) Helsingborg skapade digital mötesplats för volontärer och hjälpbehövande under coronapandemin (Helsingborg created a digital meeting place for volunteers and those in need during the corona pandemic)

²⁰⁴ <http://press.telia.se/pressreleases/telias-telefonkiosk-aateruppstaar-i-ny-version-till-isolerade-aeldre-3016284>

communication tools are widespread and commonly used in Sweden. In community housing, video conference systems for residents and their families are common.

SOLUTIONS FOR DISTANCE CARE – Nordensvälfärd centers project VOPD rapport²⁰⁵

A Swedish concept makes it possible for patients to monitor their own health by offering several different opportunities to provide samples e.g. real-time, remote ECG heart health monitoring, blood pressure, glycaemic control, and the remote monitoring of drug use²⁰⁶ with or without help, in a location close to their home. The results of most of the tests are transferred directly to a database, without having to be entered manually into the system. Video consultations can be conducted between patients and healthcare professionals. Digital night-time monitoring with cameras facilitates undisturbed sleep. Physical visits in the form of nightly patrols can be extremely disruptive for elderly people who require supervision. In Sweden, it is a common way of helping care recipients to feel safe and secure. Kramfors Municipality in Sweden uses digital night-time monitoring to enable users to enjoy an undisturbed night's sleep, while being just as safe as if they had been monitored by a person physically checking up on them (Nordic Welfare Centre, 2019, p. 49 ff.).

MEDICATION DISPENSING ROBOT

Umeå Municipality is one of several Swedish municipalities that use medication-dispensing robots to give users greater independence with their medication (Nordic Welfare Centre 2019, p. 60 ff.). The robots ensure that users receive the right medication in the right dose and at the right time. When it is time for them to take their medication, users are notified by audio and light signals, as well as by information on the robot's display. If they do not take their medication at the right time, it is transferred to a locked container and the staff are sent an alarm. The robot also helps overcome the problem of a shortage of skilled staff in many Swedish municipalities.

HEALTHCARE AT A DISTANCE

Min Vård²⁰⁷ (My Care) is a digital complement to the physical healthcare centres in the region of Dalarna, Sweden. Currently, Min Vård offers citizens in Dalarna video appointments with doctors to examine new issues. The service hours are weekdays, evenings and weekends. Min Vård was run as a project for two years and has been fully implemented in the region of Dalarna since February 2019. During 2019, the service evolved by including more practitioners and different professions, and allowing patients to get revisits and follow-ups. Min Vård is staffed mutually by employees from all healthcare centres, private and public, authorized by Health Choice Dalarna. Citizens themselves decide whether they need to use the care service, then book and join the meeting via a mobile application.

²⁰⁵ <https://nordicwelfare.org/wp-content/uploads/2020/01/NWC-VOPD-EN-webb.pdf>

²⁰⁶ <https://www.rrh.org.au/journal/article/3823>

²⁰⁷ <https://www.healthcareatdistance.com/>

Contribution of technologies to mobility

GPS WATCHES

Around 60% of all municipalities in Sweden use a GPS alarm or GPS watches, a good example being Östersund Municipality (Nordic Welfare Centre 2019, p. 56 ff.). The municipality has many years' experience of using this type of technology and currently has some 350 GPS watches in operation. The number of watches increases every week. The GPS watches are used by anyone who wants to be more mobile, but still needs to feel safe. Their functionality can be tailored to each individual user. The watches can also be configured so that the alarm is sent to a partner or relative, rather than going directly to the call centre. GPS watches can provide users with a sense of freedom that cannot be offered with a normal safety alarm (social care alarm) that only works in the user's home. A GPS watch can provide the same sense of security and works everywhere. Users can get their social life back without having to be confined to their own home.

Contribution of technologies to personal hygiene

POSEIDON SHOWER AND HYGIENE ROBOT

By using this robot²⁰⁸, disabled people can shower without any assistance. Being able to manage this themselves helps to increase both the users' personal dignity and their self-esteem. At the same time, it reduces accidents in the bathroom, the single biggest reason for injuries within healthcare. The shower is automated through advanced software, sensors and motors.

Contribution of technologies to nutrition management

BESTIC ROBOT

The Bestic robot²⁰⁹ helps disabled people to eat without assistance. Eating independently and not being fed means a lot in terms of their self-esteem and quality of life. Although there have been eating robots from Japan and the US on the market before, they are large and heavy. By contrast, the Bestic robot weighs two kilos and can be placed next to your plate on the table. It is quite discreet, and you can easily bring it to school or a restaurant. The user controls which pieces of food are to be lifted to their mouth by means of a control device. This can be a keypad or joystick that they operate with their hands, feet or head. The company is also developing eye control in collaboration with the Swedish company Tobii. Possible features in the future include tooth brushing. The idea behind Bestic was hatched by Sten Hemmingsson, who himself wanted an eating aid.

²⁰⁸ <http://roboticscare.com/poseidon/>

²⁰⁹ <https://www.camanio.com/us/products/bestic/>

Contribution of technologies to cognitive and communication skills

APPSÖK APP SEARCH SERVICE

There are a lot of cognitive and communication apps available for users in Sweden. As an example, we present a service called “Appsök”²¹⁰ (“app search”), a method for reviewing accessibility and analysing apps. The review provides access to validated, quality-assured information about apps, and especially about apps that can compensate for disabilities and provide support in everyday life. More and more people with different types of disabilities are now looking for apps to support them in everyday life. The range of apps is now huge, and the information is often unclear. This makes it very hard not only for individuals, but also for practitioners and advisers to find their way through the app jungle. App Search can be used by both professionals and users.

Contribution of technologies to personal safety and security

We are facing a double demographic challenge. The ageing population’s need for health and care services is increasing, at the same time as the supply of labour is decreasing. Digitization is becoming increasingly important in allowing municipalities to offer high-quality health and care services. Various types of location technology for people with cognitive impairments or dementia are being tested. Several municipalities have offered location technology as part of their rehabilitation activities. Users with learning disabilities enjoy both a high level of security and the freedom to spend time outdoors with the aid of virtual fences (geofences), which trigger a warning when the user enters or leaves a geographic area. Devices with a two-way voice function can be useful, but not all users know how to use these devices. Finding techniques that are reliable and convenient is a challenge. GPS technology for tracking users is another solution that is used in many municipalities. Various types of location technology have been tested.

Benefits for the user

- Users of the service and their relatives enjoy an increased sense of security, freedom and quality of life.
- Their day-to-day life is safer and more active, and their social and mental stimulation is improved.
- GPS means that relatives or staff do not have to divert a person diagnosed with dementia or cognitive impairments, or prevent them from going out.
- The use of location technology is the least intrusive measure for some users.

²¹⁰ <https://appsok.sll.se/>

Contribution of technologies to high-need care for high dependence

DIGITAL NIGHT-TIME MONITORING

Digital night-time monitoring with cameras facilitates undisturbed sleep. Physical visits in the form of nightly patrols can be extremely disruptive for elderly people who require supervision. Several municipalities in Sweden use digital night monitoring to enable users to enjoy an undisturbed night's sleep, while being just as safe as if they had been monitored by a person physically checking up on them. The whole purpose of using cameras is to match the unique needs of each user. Users can choose between physical visits and digital monitoring at night. The number of checks performed is the same. It is easy to satisfy individual needs if the checks can be performed using a camera, as there will be no need to schedule visits to match a driving schedule. A camera and a mobile router are installed in the user's home, and the camera is pointed towards the bed. An assistant nurse at a central unit in the municipality conducts digital checks at specific times during the night, as agreed with the user. The unit makes 30 digital checks per night. The time required to conduct digital checks, less than half an hour for all 30, must be compared to the actual time it takes, one-way, to drive to users.

Contribution of technologies to life and care planning in the context of uncertainty

Public policy dictates that social care services based on democracy and solidarity support individuals, giving them a) economic security, b) equality in living conditions and c) active participation in society. Each municipality is responsible for the social care in that area and has final responsibility for ensuring that individuals receive the support they need. When an individual needs support with both healthcare and social care, the municipality and the county council draw up a plan. The individual must consent to such a plan being drawn up.

AITOPYA

AITOPYA²¹¹ is an AI-powered digital medical service for patients and caregivers. The application increases productivity in primary care by 40% by providing patients with a series of questions they can answer at home or in the waiting room. The answers are then transferred to the caregiver before either a physical or digital consultation. In July 2020 the brand name was changed to BYON8.

Digital literacy

In Sweden, the majority of the population state that they feel included in the digital society. As many as 88% say that they feel involved, with 27% feeling involved fully and 41% to a large extent (together 68%), and 20% saying that they feel only slightly involved. Those who do not feel involved at all make up 9%, and 3% respond that they do not know whether they feel involved in the digital society or not, which may indicate that there is some ambiguity in the concept of "digital society". From the patient's point of view, communication and information-sharing can be made possible by allowing care to be managed

²¹¹ <https://www.byon8.com/aitopya-becomes-byon8>

online. This is especially important given that the chronically ill tend to be elderly – despite the increased use of tablet computers among the elderly in recent years, those aged over 75 still feel least involved in today’s digital society. Providing next-of-kin access could become crucial in enabling elderly patients to take advantage of these digital and virtual solutions. Sweden aims to reduced inequality in digital inclusion and to provide useful educational programmes, guidelines and tools for improving citizens’ societal involvement. One aspect is to use cross-generational teaching and learning, linking young people (digital natives) with the elderly. Benefits include reduced isolation, more autonomy and independence, and better health.

Contribution of technologies to accessing care of any type

Patients in Sweden can access digital versions of test results, appointment bookings, and doctor’s notes on the web using digital-ID, Sweden’s electronic identification system²¹².

KRY TELEHEALTH

An example of digital innovation in action is the Stockholm-based telehealth app KRY²¹³, which connects patients with doctors for digital consultations, diagnoses and treatment. Telehealth is also aimed at helping people to manage their mental health, an area often neglected by healthcare systems around the world.

People living in sparsely populated areas in Sweden usually have to travel long distances to obtain care or even just to have their blood pressure checked. For them, unstaffed health rooms are one step closer to care, because they avoid long and costly journeys to health centres or hospitals. Virtual health rooms can be found in sparsely populated municipalities in Västerbotten County in Sweden. As access to public transport is limited and the quality of the roads is sometimes poor, some groups in society do not seek medical help unless they have extremely urgent needs. This can result both in higher costs for the required treatment and in a lower quality of life for the patient. The purpose of the Swedish services is to bring care closer to citizens. The Swedish concept makes it possible for patients to monitor their own health by offering several different opportunities to provide samples, with or without help, in a location close to their home. The results of most of the tests are transferred directly to a database, without having to be entered manually into the system. Video consultations can be conducted between patients and healthcare professionals.

Another example is COPD. People who live with chronic obstructive pulmonary disease (COPD) need to manage their condition for many hours during the day. This may be associated with a high degree of uncertainty, and patients often have to be admitted to hospital. A national telemedicine solution makes it possible for people with COPD to measure their values at home and send the readings to municipal health professionals, who can monitor the course of the illness, take action and provide support.

²¹² Skaffa e-legitimation (Obtain e-identification)

²¹³ <https://www.kry.se/om/>

Benefits for the patient

- Increased access to health and medical care, making care fairer within the region.
- Shorter time until diagnosis and possible treatment.
- Fewer journeys, with a positive impact on finances, time and safety.
- The health rooms fulfil a social function as they can become a natural meeting place when staff are in the room.
- Patients do not need to buy their own medical equipment, such as blood pressure monitors. Instead, they can share the equipment with other members of the group.

Impact on the operation

- More times can be devoted to patients with more serious health conditions, as other patients can monitor their own health to a greater extent.
- Lower costs for patient travel.

Benefits for society

- Positive impact on the environment due to fewer journeys.
- Other organizations can also make use of the room and the technical equipment.

Prerequisites for successful implementation

Telemedicine solutions in sparsely populated areas must be supported by the people who live in the area, as otherwise they will not be used. It is therefore important to involve the local community from an early stage of the process. There is also a need for good cross-sectoral cooperation between all the organizations involved in the process. Healthcare professionals may need to get used to meeting their patients via a video link. Healthcare providers from both the region and the municipalities must reach an agreement and collaborate regarding implementation. The technical equipment in the room should be selected with care and must be extremely intuitive to use, even for beginners. However, some form of introduction may be required for people to be able to use the medical equipment. Video communication requires high-quality network access.

Contribution of technologies to carer skills

The National Board of Health and Welfare provides online education in various health and care areas. The board also publishes statistics in the areas of health and medical care and social services. The Government has overall responsibility for education and sets the framework, including national goals, regulations and national improvement initiatives for education. The Swedish Education Act constitutes the basis for all education from pre-primary to upper secondary level, as well as the right to education for adults. Based on the Education Act, the Parliament, Government and/or National Agency for Education provide a more detailed framework regarding curricula, ordinances, recommendations and national development initiatives. The municipalities are responsible for organizing educational programmes in accordance with existing legislation. The municipalities also have the main financial

responsibility for education. To meet the challenges that exist both internationally and nationally, the Swedish Government wishes to make use of the opportunities offered by digitization, and has therefore taken a decision called “ICT for Everyone – A Digital Agenda for Sweden” and proposed a new goal for ICT policy, namely that Sweden should become the best in the world at exploiting the opportunities of digitization.

1177 HEALTHCARE GUIDE

The public can call 1177 or visit <https://www.1177.se/>, for healthcare advice twenty-four hours a day, year-round, all over Sweden. Nurses at 1177 Healthcare Guide answer questions by phone, determine the need for further care, provide advice and/or recommend other healthcare agencies. Every county council/region provides healthcare advice on its own or through contracted advice providers. Through a national network, healthcare advice providers can cooperate should the need arise. Around 500 000 people call 1177 per month.

Two useful tools for healthcare professionals are connected to Healthcare Guide 1177: the phone-based Decision Support System and a website, the Decision Support Web. They are based upon the same medical content as 1177.se. The Decision Support System is a working tool for the nurses who work with Healthcare Guide 1177. It contains integrated phone-based medical information and documentation. The services offered through Healthcare Guide 1177 are a part of the healthcare in the county councils/regions and provide the public with an additional opportunity for in-depth information and/or contact with the healthcare system. The goal of Healthcare Guide 1177 is to increase access to healthcare, strengthen the position of the patient and help improve public health.

MEDICINE CHECK by Swedish eHealth Agency

“Medicine check”²¹⁴, a service provided by the Swedish eHealth Agency²¹⁵, helps patients to keep track of their prescriptions and medicines. Using electronic identification (e-ID) and logging in to medicine check, patients can see prescriptions, what medicines they have collected, and how much more they will have to pay before they are eligible for high-cost protection. There is also a possibility to download personal data from pharmaceutical registers. Parents or guardians can see prescriptions for children under 12.

Contribution of technologies to give voice to recipients of care

1177 HEALTHCARE GUIDE

The online Healthcare Guide <https://www.1177.se/> is Sweden’s national hub for advice, information, inspiration and e-services for health and healthcare. You can read about diseases, treatments, rules and rights. Here, you can also find and compare health clinics and use e-services to contact the healthcare services, request, cancel, or reschedule appointments or re-issue prescriptions. All the content on the

²¹⁴ <https://lakemedelskollen.ehalsomyndigheten.se/lmkoll-web/>

²¹⁵ <https://www.ehalsomyndigheten.se/other-languages/english/>

Healthcare Guide 1177 is quality assured together with experts from healthcare throughout Sweden. All information transfers are protected (encrypted) and meet public health system standards for security and confidentiality. The website 1177.se is free of commercial interests and owned by all county councils and regions. 1177.se has around 12 million visitors a month.

SPETSPATIENTER

A lead patient (spetspatient in Swedish) is a patient or family member who takes greater responsibility for their own health and well-being. They meet their health-related challenges in a constructive and knowledge-based way, while taking their physical and mental abilities and capacity into account. Lead patients make use of their own experiences to improve healthcare, on all levels of the system, for the sake of both themselves and other patients. They often meet their challenges in a creative manner and can be seen as innovators. Often, they do not become a lead patient by choice; it is something that they do to be able to manage and navigate the complex healthcare system.

Further examples

MEDICATION-DISPENSING ROBOTS provide increased quality of life

As mentioned above, Umeå Municipality is one of several Swedish municipalities that use medication-dispensing robots to allow users to become more independent with their medication. Even though the medication-dispensing robot was only introduced to Umeå Municipality relatively recently, the municipality has already noted considerable benefits from the technology and the working methods. In addition to the fact that users can take responsibility for their own medication, other positive effects include increased compliance with the medication and fewer work journeys for the staff.

MEDUNIVERSE

MedUniverse²¹⁶ is a patient case platform founded in 2009, facilitating faster and more efficient engagement between healthcare professionals and pharmaceutical companies and supporting better patient outcomes. Customers from the pharmaceutical industry can create interactive patient cases that can be used to gain insights from specialist doctors and other healthcare professionals (HCPs). In turn, HCPs can increase their knowledge of the latest treatments and gain insights from the experiences of their peers.

ASTHMATUNER

AsthmaTuner²¹⁷ is an app from MediTuner. One in ten people suffer from asthma, and while medicines today are very effective, many people are still undiagnosed and are not receiving the right treatment. Patients download the AsthmaTuner app and share access with their nurse or asthma doctor, who can easily upload a treatment plan based on international treatment guidelines. Patients are then able to measure their lung function and register symptoms in the AsthmaTuner app to find out which inhaler

²¹⁶ <https://meduniverse.com/>

²¹⁷ <https://asthmatuner.se/>

to use and the recommended dose that day. The app also helps them keep track of symptoms and lung function over time.

PILLOXA

Pilloxa²¹⁸ is a patient-centric adherence platform that allows patients to easily track their medicine intake. Patients receive a smart pillbox which uses sensors to detect when a dose has not been taken in time. If one is missed, a notification is automatically sent to the mobile app. The data on compliance can also be used to motivate patients, and to analyse user patterns to see how medicine intake correlates with other health data.

5.6.3 Summary

Digitization offers great opportunities for future social services and health and medical care. Modern information and communication technologies can make it easier for individuals to be involved in their own health and social care, support contact between individuals and service providers, and provide more efficient support systems for staff employed by service providers. The next major steps in the implementation of the eHealth strategy is to develop regulatory frameworks, standardise terms, and reinforce work on better describing the needs of county councils, municipalities and private or not-for-profit care providers. The purpose of this process is to develop a common description of the activities of the health and social care services, focused on the need for an integrated view of individual health and social care services. By clearly identifying issues, we can make significant progress towards better care for patients.

5.6.4 References

- Nordic Welfare Centre (2019). Healthcare and care through distance-spanning solutions – 24 practical examples from the Nordic region. <https://nordicwelfare.org/wp-content/uploads/2020/01/NWC-VOPD-EN-webb.pdf>
- Naverlo, S., Carson, D., Edin-Liljegren, A., & Ekstedt, M. (2016). Patient perceptions of a Virtual Health Room installation in rural Sweden. *Rural and Remote Health* 2016; 16: 3823. www.rrh.org.au/journal/article/3823

²¹⁸ <https://pilloxa.com/>

6

Similarities and
differences between
countries

Anne Meißner

All of the participating countries of this project face similar demographic, epidemiologic, and societal challenges, although the details differ. Technical innovations are unanimously considered to offer a high potential to address the change from traditional to new care and support arrangements. At the same time, all agree that technology has limits that should not be exceeded. However, as the national reports show, different countries have taken different approaches to exploiting this potential. The major findings are as following:

Consistency between care frameworks and technologies

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. As a result, there is no evidence of a coherent approach to innovation in the use of technologies in ageing and care in any of the participating countries. Nevertheless, there is evidence of a great deal of activity to address the challenges and ensure quality of care, in response to the demographic challenges.

All participating countries have recognized the importance of technologies in care, and most countries have some form of national digital strategy. 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 the 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 Digitalization”) 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.

Implementing technology in the field of ageing and care is inherently challenging, and the national reports illustrate the 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 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.

Strengthening informal care

Although the number of informal caregivers in Europe exceed those of formal caregivers, they often play an invisible role in welfare systems. In this respect it is interesting to note that most strategies reported in the country introductions relate only to formal care, and strategies for strengthening informal care are hardly reflected in the reports. However, many of the presented products address older people and informal carers, rather than formal care settings, and there are major problems in making knowledge about technological opportunities and financing options available to these target groups. More effort is required to ensure appropriate technological products, services and support for informal care, both users and carers.

Human rights

Respect for human rights is a key element of our vision of good later life and good care. All participating countries are committed to internationally agreed human rights standards, although these are reflected 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, e.g. the dignity of older people. Moreover, this study suggests that some human rights standards may be better protected by some technical systems than others.

Although there are a range of international agreements which are relevant, the circumstances of older people in need of care are rarely explicitly covered either EU-wide or internationally (ENNHRI, 2017, p. 29). 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 intensive reflection and exploration.

It is of vital importance to bear in mind that care is socially and individually indispensable yet is a steadily decreasing resource. Nevertheless, the situation for carers of any kind and people to be cared for is getting worse and worse, among other things due to globalization, economization, and demographic change. The consequences are more and more often seen in open as well as hidden working and care conditions and encounters that are contrary to human rights and inhumane (Mahler 2020). Nevertheless, there is currently no human rights framework regulating the right to receive care. Consolidating the law in that respect would mean greater clarity for countries and for the resulting

obligations and implementation strategies. Following ENNHRI (2017) relevant human rights standards in later life bearing in mind the critical role of care:

- 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

Standards of human rights are necessarily set at an abstract level, but are interpreted at an individual level, and are impossible to fully standardize. 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 (Kring & Weinberger, 2017). This raises important questions about the nature of human rights when using specific technological products in individual situations within caregiving²¹⁹.

It is of vital importance to firstly use human rights principles as a yardstick for good care. Secondly, technological innovations need to be evaluated upon their match (positive or negative) with human rights, both in principle and in relation to particular care relationships. Taken together, it seems paradoxical to evaluate technology from a human rights perspective, but not the care on which the technology is embedded. Therefore, greater efforts are needed to ensure human-rights-based care.

Technological approaches

The national reports describe a wide range of technical innovations, including around 150 specific products. These systems address a range of groups and specific care issues and refer to different needs. The expert group agreed on a set of need (specific care) issues as a basis for classifying the innovations.

²¹⁹ It should be mentioned that the MEESTAR study may be a good starting point for further reflection on human-rights-based care within ageing and technology (Manzeschke et al. 2013).

Altogether, there is a wide range of technological approaches addressing different needs. Products covers all kind of technology, including apps, robots, and digital services, but also VR, GPS monitoring etc. Technological innovations address 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). Each specific care issues show a different number of products. There appear to be fewer products related to physical needs like nutrition management or personal hygiene.

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. Due to the functionality of a diary formal caregivers can make notes, post pictures, or video clips. In short: The app may enable the family to be updated about their relative. All types of people in need of care are equally addressed by this app.
- *Personal hygiene*: products cover apps connected with personnel 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 standardized and digitally controlled laundry service, only for outpatients – like meals on wheels, but for laundry.
- *Nutrition management*: products cover robots and apps connected with personnel or instruction services or smart glasses. All have the aim to support peoples’ nutrition management, using a range of approaches. The French product AUXIVIA e.g. connect drinking vessels via Bluetooth to a monitoring platform, that analysis drinking patterns. This product helps family carers or caregivers in nursing homes to monitor hydration.
- *Personal safety and security*: products cover platforms, GPS technology, automatic lights, smart medicine dispenser, AI with sensors, or monitoring systems. Products address the need to feel safe and secure, also 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 could also be used as an aid for people with early-stage dementia to receive instructions for everyday life activities, but it is mainly used for reminiscence. 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, and connected devices. The Swedish product SMARTCANE e.g. is a connected

walking-stick based on AI. The stick reports unusual inactivity to caregivers and alerts family members.

Products in use in more than one country

Very few of the products in this report are in use in more than one country. Exceptions are PARO and the Tovertafel. Paro is a socio-emotional 60-centimetre robotic baby seal, programmed for human reactions that allows the documented benefits of animal therapy to be administered to patients in environments such as nursing homes. Paro is a Japanese product and is in use in many facilities in France, Germany and the Netherlands. Different studies in the last two decades summarize its benefits and barriers. Responses to PARO are mixed. The Tovertafel in contrast is a relatively new product, but it is growing in popularity. It is an interactive game that intends to get older people moving. Sensors monitor and respond to hand movements of people sitting at the table, e.g. catching autumn leaves as one game. The first Tovertafel was created co-designed as part of a dissertation project. Today, it addresses people with dementia, people with learning disabilities and children with autism. Research suggests that playing with the Tovertafel may lead to a better well-being of residents with moderate or severe dementia in nursing home. However, due to the random selection of products, some may not show up.

Similar products in various countries

Quite a few products mentioned in this report have been developed in parallel in different countries to serve the same needs. The COMPAAN tablet from the Netherlands e.g. enables people with mild dementia to connect, easily surf the internet, stay in touch, receive photographs, or play games. The German developers of the MEDIA4CARE tablet adopted a similar approach, again aimed at people with dementia and with very similar functionalities.

How to find products for a specific need?

The products mentioned in this report have been classified by relevant needs, demands or phenomena. When assigning the products of the national experts to issue the allocation was not always intuitive as complex technological products can certainly address more than one issue/need. This once again illustrates the difficulty of categorizing technological devices regarding specific needs. This may be one reason why theoretical models are rare.

The development of technology in this field 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. Helpful technology can come from different areas, e.g. specialized medical industry, do-it-yourself (DIY) stores, electronics stores. Helpful apps are also usually only distributed via the Apple and Google app stores. The active 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, and restaurants, why not for care technology? We need to develop an information and advice system to help potential “customers” to choose appropriate tools and technologies for their particular needs. To support the scalability of new care technologies/products an international platform independent of suppliers could be useful. All products from all countries could be integrated including the specific national funding options and up to date service and support contacts. It may be worthwhile to look at commercial models, like those in use on travel websites, to develop such a service. Since finding a technical option does not yet ensure that it can be financed when needed, it would be helpful if financing issues could be addressed at the same time.

Need for evaluation of products

As intended, the composition of products mentioned in this report is diverse. It may be useful to compare them in more detail to derive indications for further research, development and innovation. One approach may be to intensively evaluate the products against their compatibility with human rights using different scenarios.

Essential information on products is still missing

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 actual needs of older people in need of care and their carer. 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, only little has been learnt about the impact of the system, since it provides information on the number of systems sold, but not on those currently in use. An international survey of people in need of care and their technical systems may be illuminating. Established regular surveys such the Annual German Statistic on Care (“Pfleigestatistik”) could integrate categories that refer to technologies in care.

Technologies in care should do both: compensate and empower

Many technological approaches focus on mitigating losses within the process of ageing, while there appears to have been less attention to technologies concerned with well-being, psychosocial growth and a meaningful life. It may be an overemphasis on the design of innovative technologies and not enough emphasis on the social and organisational aspects. Above all, there seems to be a rather substantial mismatch between the approaches. Since it is known that older people tend to choose more emotionally meaningful goals and to associate few but relevant activities with them it would seem to suggest that a deeper understanding on interrelations between technologies that are connected to well-being, psychosocial growth and a meaningful life and social change is needed. It should be emphasized here

that technical innovations are capable of covering both approaches at the same time, as is the case with exergaming, for example.

Guarantee interoperability

Apart from client record systems there was little evidence of interoperability between products, although this might be expected to maximize benefits and reduce costs, provided that the data protection requirements were sufficiently stringent. To ensure interoperability a standard for data structures would be helpful.

Financing costs

The national reports show that a stringent strategy to support technology development for care in later life hardly exists. The coverage of costs for certain technologies in care always seems to be an individual decision depending on the status of the patient, its income and e.g. the portfolio of the Health Insurance. Sources of finance are fragmented, with origins in a range of fields from specialized 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, relying heavily on funding from health care and social welfare organizations (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 willing 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.

Products being developed with R&D funding often end with a prototype only and would be depended on a source to raise the technology readiness level. The most resilient technologies are those that identify at an early stage an appropriate funding source willing to pay for the service (cf. national report France) when ready.

Overall, investment and innovation are driven by different interests, leading to inconsistencies. A strategy to provide independent information about financing options has not been reflected in the reports. The range and diversity of innovations is too extensive and changing for a coherent overview, but a strategy to create greater coherence is highly desirable.

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 guidance

To recognize the strategic implications of technical innovations for care services, to promote their dissemination and to estimate the impact of digital innovation on older people's lives, strategic guidance in a changing care-market may be helpful, but we found no examples. More often, we found a failure of the introduction of new technologies and therefore of social innovation as a result of insufficient interaction between different bodies operating in the field – namely older people in need of care, informal and formal caregivers, service providers, technology companies – and those requesting technologies (private and public institutions).

Research activities

In order to proactively promote technological change, it is not only necessary to promote extensive research, but to use the findings to better shape it. However, one of the most obvious findings to emerge from the countries reports is that there is 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. Therefore, new agile research methods are needed. Understanding what older people and all kind of caregivers see as meaningful care technologies is essential for developing products that people want to use. Additionally, understanding their digital literacy, their health 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 (e.g. Krick et al., 2019). 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 mobilization

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 comply with the law and consumer protection, and 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 heterogeneous 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 and health literacy must also be taken into account.

Use and demand of technologies during COVID-19

The COVID-19 pandemic started parallel in compiling this report, a time of crises that 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, are 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 regarding 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, caregivers 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 caregivers.

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 by these special circumstances. At the same time, it is becoming apparent that some issues that formerly have not received enough attention are suddenly becoming extremely relevant, e.g. broadband coverage or digital literacy. 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.

7

Policy pointers

Link digital strategies with the relevant national frameworks

- the link between digital strategies, ageing and care frameworks and human rights standards and the coherence between them should be transparently demonstrated in each country
- the responsibility and accountability for new technologies and their applications must be clearly defined
- filling the legal vacuum may help those who are developing new technologies which may currently be constrained by bureaucracy. In addition, people in need of care and all kind of caregivers can rely on and trust in legal coherence

Initiate a discourse on human rights standards in ageing, care and technologies

- use human rights principles as a yardstick for good care - consolidating the law in that respect would mean greater clarity for countries and for the resulting obligations and implementation strategies
- vitalize the abstract framework of moral standards in ageing and technology by referring to human right standards when developing technologies (refer in each case to the respective human right that technology can contribute to)
- develop scenarios of care with the specific technology and challenge them to make them better

Create the path of R&I funding

- understanding what older people and all kind of caregivers see as meaningful care technologies is essential for developing products that people want to use (end-user participation and involvement)
- use already available findings better
- focus of R&I funding should be on application (care issues on ageing) rather than the possible scope of technologies
- new agile research methods are needed
- refer in each case to the respective human right that technology can contribute to (scenarios must be described)
- fund the testing of prototypes as the targeted markets have often no resources (be it personnel or finances) for this
- focus on the intentions and demands of the targeted end-user and integrate them from the beginning
- interoperability and the data structures for the exchange of data between systems must be described
- fund research in interprofessional and international consortia to support the exchange of experiences in various disciplines and countries
- fund methods and theory formation in the field of care technologies

Create a “knowledge mobilization”

- empower people of need in care for decision-making in care and with technology
- digital literacy as well as health literacy must be systematically integrated into basic training and further education for all kind of caregivers
- a strategy is needed to provide independent information about choices and financing options such as an independent authority that rigorously evaluates the products to assist consumers to choose between them or an information system categorizing technological devices regarding specific needs (look at commercial models, like those in use on travel websites, to develop such a service)

Narrow down relevant information

- there is a necessity to narrow down relevant information before the innovation reaches the market in simple language including use-case scenarios

Implement structural and human resources features

- national strategies should also integrate bridging technologies such as TV-based services
- strategic guiding in a changing care-market including the potential of technologies in specific areas of care by an advisory board at a national and/or European level
- presence of an “innovation manager” in health authorities
- promote the interaction between different bodies operating in the field such as older people in need of care, informal and formal caregivers, service providers, technology companies
- established national surveys such the Annual German Statistic on Care (“Pflegerstatistik”) could integrate categories that refer to technologies in care. A survey of people in need of care and their technical systems may be illuminating

Strengthening informal care

- a continued effort is needed to ensure appropriate technological products, services and support for older people and informal carer

Strengthening formal care

- it is absolutely necessary inspiring many young people to choose a care profession
- to attract young people choosing a care profession, changing the work, payment and qualification conditions is mandatory, thus, the emerging technology field may be an inspiring factor. Only, focus must be on care and social change and not on technology
- enable human-rights-based care

Final remarks

It must repeatedly emphasized that the fundamental impact of digital change is not based on digital devices, functions, services, or adoption but rather on the social changes that occur because of their adoption (Meißner & Kunze in Press). This intended social change in respect of the vision statement in the era of ageing and technologies should guide all actions.

8

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., Wehrich, 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., & Wehrich, 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., & 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>
- Greenhalgh, T., Wherton, J., Papoutsis, 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>
- 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. (in Press). 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. (in Press). 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 Innovation + 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.) (in Press). *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. (in Press). Soziale Akzeptanz und ethische Angemessenheit. In Meißner, A. & Kunze, C. (Eds.), *Neue Technologien in der Pflege: Wissen, Verstehen, Handeln*. Kohlhammer.
- RKI (2017). Gesundheitsberichtserstattung 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.

WHO (2015). World report on Ageing And Health // World report on ageing and health. WHO.