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Editors

Ageing and Digital Technology

Designing and Evaluating Emerging
Technologies for Older Adults

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Chapter 1

Ageing and Emerging Digital Technologies



Barbara Barbosa Neves and Frank Vetere

Abstract How can we design and evaluate digital technologies to meet the needs, desires, and aspirations of a growing number of older adults (aged 65+)? This overarching question guided this multidisciplinary collection. Emerging technologies, particularly new information and communication technologies, can lead to positive outcomes in later life, contributing to quality of life and social connectedness. However, they can also increase social inequalities and exclusion among older adults. Non-use and poor use of technologies can limit access to information, public services, and opportunities for social participation. Thus, understanding different forms of adoption and use, of non-adoption and non-use, as well as its social impact is critical to inform effective development, implementation, and assessment of emerging technologies. Yet, this knowledge is often confined within disciplinary silos. To overcome this problem, this book brings together, for the first time, researchers from social and computer sciences to explore theoretical, methodological, ethical, and empirical approaches to this pressing topic. This novel multidisciplinary approach provides a comprehensive discussion of participatory design, technology adoption models, sociotechnical frameworks, ageing theories, research design, and ethical principles, while investigating technologies such as virtual reality, digital games, robots, software applications, and social networking sites. These original contributions advance our knowledge in this field, ensuring researchers and professionals have a set of enduring examples, guidelines, and practices to design and evaluate emerging technologies that address both the opportunities and challenges of an ageing population.

Keywords Ageing · Emerging technologies · Digital technologies
Sociotechnical systems · Multidisciplinary research

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Highlights

- Effective design and evaluation of emerging digital technologies that address the needs and aspirations of older adults require a multidisciplinary approach that captures multidimensional knowledge.
- Ageing is a heterogeneous experience, marked by both structural (e.g. social class, education) and agentic dimensions (e.g. individual action, attitudes, and dispositions). Thus, designing and studying new technologies represent exceptional challenges that this collection sought to investigate.
- The book is motivated by the need to overcome dualisms regarding the effects of technology—i.e. positive versus negative—privileging contextualized approaches that explore positive and negative impacts and their interplay.
- The collection is also guided by the understanding that researchers and the technology we develop and study can both empower and disempower individuals, depending on its context. Therefore, ethical considerations, responsible research, and reflexivity are central to the book.
- Although from different disciplines, the chapters presented herein depart from shared conceptualizations of technology as sociotechnical processes. Additionally, while studying technology from distinct disciplinary lenses, our contributors report critical intersecting and complementing challenges and opportunities.

1.1 Introduction

Emerging technologies, especially those that are mobile and wearable, can have a critical role in meeting the needs and aspirations of a growing number of older adults (aged 65+) and oldest old people (aged 80+). Such technologies can be used to foster social connectedness and participation, civic inclusion, and access to public services. Thus, if well designed and easily accessible, these technologies can contribute to well-being and quality of life, support independence and autonomy, and assist with age-related impairments and other limitations (Baecker, Sellen, Crosskey, Boscart, & Neves, 2014; Baker, Waycott, Pedell, Hoang, & Ozanne, 2016; Cotten, Anderson, & McCullough, 2012; Choi, Kong, & Jung, 2012; Czaja & Lee, 2007; Freedman, Agree, Marin, & Corman, 2006; Gruner et al., 2012; LaPlante, 1992; Lifshitz, Nimrod, & Bachner, 2016; Neves, Franz, Judges, Beermann, & Baecker, 2017; Quintana, Cervantes, Sáez, & Isasi, 2018; Delello & McWhorter, 2017).

Adoption and use of new technology among older adults have significantly increased in the last decade; although when compared to other age groups, older adults are still less likely to adopt new digital technologies and are more likely to discontinue use with age (Berkowsky, Rikard, & Cotten, 2015; Neves, Amaro, & Fonseca, 2013; Smith, 2014). However, this so-called digital divide is not merely age-based or ‘grey’, but intertwined with dimensions such as social class, education, income, gender, living settings (Neves, Waycott, & Malta, 2018). The reasons

for non-adoption and discontinuity are, therefore, complex. Non-use and poor use are due to a range of factors which include inadequate design, lack of accessibility, inadequate digital literacy, and disadvantaged sociotechnical contexts (Barnard, Bradley, Hodgson, & Lloyd, 2013; Johnson & Finn, 2017; Neves et al., 2017; Hawthorn, 2006; Tsai, Shillair, & Cotten, 2015; Waycott et al., 2016). The reasons are complex and the consequences are significant. Non-use can result in social exclusion and civil disempowerment (Hill, Betts, & Gardner, 2015). Non-use prevents older adults from accessing important societal information and community services that can offer benefits for autonomy, well-being, and social participation (Quan-Haase, Wang, Wellman, & Zhang, 2018). For example, essential public services in many industrialized countries are migrating to online only (see, European Union, 2017; United Nations, 2016). This means that those who cannot access or do not have the skills to access these public services are excluded from vital public information and resources.

In addition to non-use, poor use can be detrimental. Specific types of poor use, often associated with inferior device usability or lack of critical digital skills, can also lead to exclusion or hinder competent and safe interactions with technologies. Hence, both non-use and poor use contribute to different levels of digital inequality and must be considered in the design and evaluation of emerging technologies (Choi & DiNitto, 2013; Hargittai, Piper, & Morris, 2018). Furthermore, it is important to contextualize non-use, poor use, use, and all interactions in-between, to adequately discern its diverse impact (Fernández-Ardèvol, Sawchuk, & Grenier, 2017; Neves & Amaro, 2012; Neves et al., 2018; Quan-Haase, Williams, Kicevski, Elueze, & Wellman, 2018).

The success and positive impact of emerging technologies among older people largely depend on a mix of effective design, implementation, and evaluation (Baker et al., 2016; Neves et al., 2017; Waycott et al., 2016). Nonetheless, critical knowledge about these factors tends to be contained within disciplinary boundaries. Thus, a critical multidisciplinary approach is required. In response, this book brings together sociologists, gerontologists, computer scientists, engineers, and architects to tackle this transdisciplinary challenge.

This edited collection focuses on the design and evaluation of emerging technologies to address the challenges and opportunities of an ageing population. It offers an innovative and comprehensive approach by examining not only current technologies, but also a set of enduring theoretical, methodological, ethical, and empirical issues that will support researchers and professionals who are seeking to make valuable use of fast-changing technologies in later life.

1.2 Ageing and Emerging Digital Technologies

An ‘ageing population’ is a sociodemographic term used in industrialized countries to denote increasing life expectancies and decreasing fertility rates (United Nations, 2017). In particular, the term is frequently used to represent a societal issue, a

pressing challenge, a daunting social ‘tsunami’, and ‘Boomageddon’ discourses (Curryer, Malta, & Fine, 2018). Furthermore, ideas of irremediable intergenerational conflicts (e.g. young versus old people) abound in public and political discourse; ideas not usually backed by evidence, rather based on a superficial analysis of generations (see, Szydlik’s critique, 2016). A comprehensive understanding of generations, ageing, and social worlds requires the examination of intertwining structural dimensions, such as social class, gender, race and ethnicity, status, among others (Timonen, 2016; Szydlik, 2016).

An ageing population does imply pressing societal challenges, from health to welfare systems (UN, 2017). But ageing also implies opportunities such as longer lives to share with loved ones and communities (Baecker et al., 2014). Longevity is the result of extraordinary human and social progress, due to improvements in health care, education, sanitation, housing, and lifestyle (United Nations, 2017). Over two centuries, from 1800 to 2001, the global life expectancy rate has increased from 30 years to an average of 67 years (Riley, 2005). Recent projections indicate that the life expectancy rate of the global population is estimated to increase from 71 years in 2010–2015 to 77 years in 2045–2050, and the oldest old group (>80 years) is expected to triple by 2050 (United Nations, 2017). Despite potential challenges and pressures on social and fiscal systems, the United Nations recognizes that: ‘Older persons are increasingly seen as contributors to development, whose abilities to act for the betterment of themselves and their societies should be woven into policies and programmes at all levels.’ (2018, para. 6). Older adults are already gradually extending their working lives not only because of better health and personal choice, but also to avoid poverty, dependence on retirement pensions, and societal costs (Biggs, 2017). Adding to social contributions, older adults make a valuable economic contribution through, for instance, the time devoted to unpaid care for families and communities and voluntary work (Vaus, Gray, & Stanton, 2003).

Alongside diversity in the social structures that shape ageing (from social class to gender), it is critical to address diversity in terms of agency or individual action and choice. The notion that ageing is a homogenous experience and older adults are a monolithic group has been questioned by sociologists, gerontologists, and computer scientists (Curryer et al., 2018; Cutler, 2006; Neves et al., 2018; Righi, Sayago, & Blat, 2017; Vines, Pritchard, Wright, Olivier, & Brittain, 2015). Yet, these notions still permeate our general sciences and popular narratives. With changing life expectancies, societal definitions of being ‘old’ are altered over time (Neves & Amaro, 2012). Definitions of ‘old’ are also influenced by technological contexts (e.g. ‘being too old for new technology’), by the social values embedded in its design and function (see, for instance, Katz & Marshall’s provoking article on technology and the aged body, 2018). Experiences of ageing and later life are shaped by a myriad of structural dimensions, such as social, cultural, economic, historical, and political factors, as well as agentic contexts, such as individual-based choices, attitudes, and dispositions (Fennell, Phillipson, & Evers, 1988; Morgan & Kunkel, 2006; Timonen, 2016). Ageing is both a complex physical phenomenon and a social construction (Curryer et al., 2018; Fennell et al., 1988; Marshall & Bengston, 2011).

Because ageing and ‘being old’ are a multifaceted experience and status, different age categories have emerged in the literature to overcome the simple chronological indicator based on number of years. These identifiers of ageing, such as functional, perceived, social, or cognitive age, might be richer in capturing ageing diversity than chronological age (Neves & Amaro, 2012). However, in this book, we use the chronological age of 65+ as the common cut-off to refer to older adult cohorts; 65 is the statutory retirement age in most industrialized countries (although this is also changing). Furthermore, chronological age is the most commonly used identifier in both social sciences and computer sciences and so, for this book, more appropriate than the other aforementioned indicators. We acknowledge that there are age-related characteristics based on ageing experiences and biological aspects that strongly correlate with age (Johnson & Finn, 2017). But while chronological age is an important indicator, our approach recognizes a high-level of biopsychosocial variation in later life (more prominent in older than in younger age groups) and the interplay of age with the social structures and agentic dimensions discussed above (Hawthorn, 2006; Johnson & Finn, 2017; Morgan & Kunkel, 2006; Timonen, 2016).

It is within these perspectives—i.e. diversity of/within social structures, agency in later life, and giving voice to older adults and their contributions—that we address the design and evaluation of technology. Our main focus is, thus, on how digital technology can be designed, implemented, and evaluated to cater to older adults’ needs and aspirations in both comprehensive and nuanced ways. Due to the inherent diversity of ageing, designing and studying for and with older adults represent unique challenges that we sought to explore in this collection. We also aimed to overcome dualist approaches to technology (positive versus negative; utopian versus dystopian) by exploring both positive and negative impacts of technology, its contexts, and how they interplay.

Although this collection brings together different disciplinary perspectives, it is motivated by an understanding of technology as sociotechnical systems; i.e. systems that include technological, social, cultural, historical, economic, and political dimensions. Embedded in this approach is a rejection of technological determinism, which is the assumption that technology is the sole motor of history and social change, and therefore, external to society or autonomous from social, political, economic, and cultural forces (MacKenzie & Wajcman, 1999; Wyatt, 2008). By rejecting technological determinism, we stress the role of human agents in the process of technology development. We highlight the importance of taking responsibility for the systems we develop and use (Wyatt, 2008; Mead & Neves, 2018).

The motivation to adopt a multidisciplinary lens also comes from our own experience in designing and evaluating new technology with and for older adults. For instance, although working on distinctive app-based projects—*InTouch* (Baecker et al., 2014) & *Enmesh* (Waycott et al., 2014)—in different countries (Canada and Australia), and from different disciplinary perspectives (sociology and human–computer interaction), we have reached similar conclusions and faced comparable challenges. Taken together, our research has demonstrated the need to

recognize: (i) diversity in later life, (ii) variety of biopsychosocial factors intertwining with ageing, (iii) the complexity of technology adoption/non-adoption/use/non-use and the in-between, (iv) technology design and evaluation as sociotechnical processes, and the (v) implications of our role and position in the field in terms of both empowering/including and disempowering/excluding older adults. Challenges involved the lack of: (i) comprehensive conceptual and analytical models to frame, explain, and shed light on a range of sociotechnical contexts in later life, (ii) interdisciplinary discussions of best methods and approaches, and (iii) a space to address vital issues from theoretical frameworks to ethics and reflexivity.

This book addresses information and communication technologies for leisure, social participation, and civic engagement. We do not explicitly focus on health-related technologies. There already exist extensive resources and a variety of notable books on assistive technologies and e-health-based systems for older adults (Breuer, 1982; Brownsell & Bradley, 2003; Mihailidis, Boger, Kautz, & Normie, 2008; Sixsmith & Gutman, 2013). Although we do present a few ground-breaking chapters on assistive technologies (see, Chaps. 13 and 16), we explored a range of technologies and topics, from virtual reality to locative media, from social participation to physical exercise, in order to match our multidisciplinary understanding of ageing as diverse and multifaceted.

We are at a crucial moment in history to reflect upon the role of technology in ageing. Never before have we lived as long, and never before have we had the technology to access current levels of information and connect more widely with people locally and globally. This moment arrives with opportunities and challenges. This edited collection aims to provide the space to explore these opportunities and tackle these challenges, ensuring we are collectively contributing to this burgeoning field of ageing and emerging technologies.

1.3 Overview of the Book

This book is organized in four parts. The first part explores theoretical and conceptual perspectives to help frame research on emerging technologies and ageing. These include participatory design, technology adoption, frameworks from science and technology studies (STS), social connectedness, and combined perspectives from games research and ageing theories. The second part presents methodological techniques for designing and evaluating technologies which are relevant to older people. These include usability testing, visual methods, netnographies, and interactive research. The third part combines ethical and practical reflections about conducting research with older adults and particular sub-groups of the older population, such as people living with dementia. The fourth presents cases studies from around the world, state-of-the-art empirical research that encompasses best practices across different disciplines.

The collection is introduced by a foreword by Prof. Greg Tegart. Prof. Tegart is a leading scientist, devoted to the design and evaluation of smart technologies for older adults. He has been recognized for his lifetime's work by being awarded the '2016 Senior Australian of the Year' from his home state of Canberra, Australia. The book concludes with an assemblage of afterword contributions by eminent older and emeriti scholars in this ageing and technology field. As with the foreword, our aim was to acknowledge older academics—pioneers who have extensively worked on the topic of this book. As such, the afterword collection includes contributions by Prof. Ron Baecker (computer science) and Prof. Stephen Cutler (sociology and gerontology). Additionally, Prof. Barry Wellman (sociology) adds to this afterword collection with an intergenerational collaboration with Prof. Anabel Quan-Haase (sociology and information and media studies). In their afterword, we asked them to answer the following two questions:

- (1) Based on your research and experience, what are the main [empirical, theoretical or methodological] current issue(s) for researchers designing and evaluating digital technologies for older adults?
- (2) What do you think will be critical future issues for researchers in this field?

These outstanding scholars provided us with critical reflective and prospective insights for ageing and technology researchers and practitioners.

Part 1: Theoretical and Conceptual Approaches

Part one begins with a provocative account of 'ideal' assumptions of living labs and participatory design research by Anne Marie Kanstrup and Ann Bygholm. They argue that in practice, this type of research risks falling short of its promises when it excludes certain data. Due to the perceived difficulty in engaging frail older adults living in care homes, critical data can be discarded. As such, the authors present original conceptual ways of tackling these issues, namely through 'unused data' and 'invisible users'.

In the next chapter, Jessica Francis, Christopher Ball, Travis Kadylak, and Shelia R. Cotten offer an essential overview of central sociotechnical concepts such as 'digital divide' and 'digital inequality', focusing on their implications for ageing research and older adults. The authors then address particular models of technology adoption, such as the senior technology adoption models (STAMs), discussing its strengths and challenges as theoretical and analytical frameworks for investigating the use and acceptance of emerging technologies in later life.

Then, Alexander Peine provides a review of critical theories and approaches from science and technology studies (STS) to explore socio-material constitution(s) of later life. Peine advances a thought-provoking perspective that critiques disconnected notions of ageing and technology, by making the case for a mutual shaping (following the 'social shaping of technology' theoretical framework, popular in STS). Peine argues that digital technology is a sociotechnical phenomenon that contributes to our understanding of ageing and vice versa; ageing and technology are, thus, co-constituted. The argument challenges ideas of new technification of later life, deconstructing 'design paternalism' and suggesting new theoretical and analytical directions for gerontechnology.

Building on this theme, the next two chapters explore specific topics concerning the intersection of technology and ageing. Jenny Waycott, Frank Vetere, and Elizabeth Ozanne provide a novel framework to consider opportunities for social connectedness in later life through a range of digital technologies, bringing together insights from social gerontology and computer science (human–computer interaction). The authors provide a conceptualization of social connection that includes different but intersected dimensions. These can be useful to better understand contexts, meanings, and experiences of old age in relation to social connectedness. This framing of connectedness is valuable for informing the design and evaluation of technology to address loneliness and social isolation.

To conclude part one, Sergio Sayago, Andrea Rosales, Valeria Righi, Susan Ferreira, Graeme Coleman, and Josep Blat reflect on existing literature on digital gaming and older adults, demonstrating the need for theoretical models to curb the descriptive approach in the field. The need for more analytical rather than descriptive approaches guides them in an original examination of widely used theories of ageing from social sciences and biology. The authors discuss the usefulness and limitations of the selected theories to study adoption and use of digital games among older adults, contributing to a range of disciplines from human–computer interaction to sociology.

Taken together, these chapters offer a pressing discussion of both well-established and innovative frameworks to theorize, conceptualize, and lead our understanding of emerging technologies and later life.

Part 2: Methodological Approaches

Part two, on methodological approaches, starts with a chapter by Rachel Franz and Barbara Barbosa Neves on usability testing with and for older adults. The authors define usability, discuss its role, and share strategies to enhance the design, implementation, and mixed-methods (qualitative and quantitative) evaluation of usability tests. These strategies are based on their experience with several mixed-methods usability iterations with older adults and on advice they have collected from experts in the field. This combination of insights provides a unique approach to the method, particularly when applied to studying emerging technologies and older adults.

Then, Edgar Gómez Cruz, Jessica Noske-Turner, and Jolynna Sinanan present an innovative qualitative method that they have named ‘vignetnography’ (combination of ‘vignette’ and ‘ethnography’) based on short video clips created using mobile devices. These visual stories centre on everyday life, focusing on any selected dimension of ethnographic interest. The authors discuss this new visual method in terms of its affordances and requirements for research on digital technology and ageing, reflecting upon a pilot study.

Continuing with qualitative methods, Loredana Ivan offers an in-depth exploration of netnography, addressing its nature, main types, and practices of the technique. She also provides a fresh categorization of netnography based on research stages, as a response to criticism leveled at permutations of the method. Using this categorization, Loredana reviews the use of netnographies to study older adults’ online communities, highlighting typologies, procedures, and embedded ethical issues.

We end this section with a contribution by Stephanie Liddicoat and Clare Newton who discuss participatory design within architecture design and evaluation. The authors show that the projected increase of aged care buildings and related construction calls for a timely consideration of the impact of those spaces on the well-being of older adults and their communities. However, a key limitation in architecture is the ability to fully test structures and environments before building them. As such, they propose co-design practices and the use of virtual reality (VR) to test buildings and settings. VR can afford fairly accurate spatial experiences to be assessed by older adults.

In brief, this section offers readers innovative or refined methodological approaches to study the design, implementation, and evaluation of emerging technologies and ageing.

Part 3: Ethical and Axiological Approaches

Part three is a companion to the methodology chapters, by interrogating the ethical issues which typically arise when studying and engaging with older adults. Jenny Waycott and John Vines bring together research on technology and older adults from Australia and the UK to address ethical tensions. These tensions relate to principles and beliefs embedded in the technologies being designed or evaluated, as well as frequent disconnections between procedural ethics and micro-ethics or ethics-in-practice. The authors argue for a reflexive and adaptive approach to tackle these issues, offering a new set of strategies.

Next, Cosmin Munteanu and Stephanie Sadownik offer a critical analysis of the application of national ethics policy in fieldwork with marginalized older adults. They use several human-computer interaction (HCI) case studies of digital technology for vulnerable older adults to investigate ethical dilemmas and provide policy-based interpretations of such dilemmas. This includes a rare in-depth analysis of formal ethical guidelines and the identification of knowledge gaps in the policy's application to HCI research. The national policy used is the Canadian Tri-Council Policy Framework, which despite its national focus has international relevance due to universal principles.

To conclude this part, Grant Gibson, Katie Brittain, and Louise Robinson bring their joint expertise to a stimulating discussion on assistive technologies and older adults living with dementia. Their ethics-in-practice approach highlights the frequent exclusion of older adults with dementia from design and evaluation processes, and the consequential knowledge gap of how this group (and family) uses, perceives, and negotiates assistive technology in their daily lives. Drawing on their research, they examine projects with CCTV cameras and GPS systems (the so-called surveillance of care). The authors challenge the determinist approach to telecare and people with dementia, proposing innovative methods to include older adults as co-creators and co-testers of assistive technology. They also address the ethical issues emerging from that alternative approach.

These three chapters tackle numerous and complex ethical issues of emerging digital technologies for later life. These are reoccurring issues that require reflexive, adaptive, integrative, and cross-disciplinary approaches.

Part 4: Case Studies

Part four presents ground-breaking case studies from several countries, starting with a study on virtual reality (VR) and virtual avatars conducted by Steven Baker, Jenny Waycott, Frank Vetere, and Thuong Hoang in Australia. Their action research project used participatory methods and technology probes to engage older adults in the use and evaluation of active VR technology. The study had a set of unique features, including a group interaction and an examination of avatar selection which matched perceptions of ageing and self-presentation. The chapter concludes with novel strategies to involve older adults in participatory research with emerging technologies.

The following chapter by Adriano Pasqualotti, Fausto Amaro, and Barbara Barbosa Neves reports on an experiment with exergames (i.e. digital games that combine cognitive and physical exercise) and older adults in Brazil. The aim of the project was to evaluate the impact of exergame use on eight neuropsychological functions in later life, such as attention span and visual and verbal memory. The authors then reflect on implications of the results of the intervention (exergames) and control group (traditional games), but also on the limitations and opportunities of both exergaming and conducting experimental research with older adults.

Next, Kazuhiko Terashima and Ryo Saegusa discuss the development and pilot evaluations of two bespoke mobility robots, Niltwamor and Lucia. These walking assistance robots facilitate the rehabilitation of walking problems such as gait disorder, which is particularly limiting in old age. This chapter contributes to robotics and assistive technologies by presenting innovative technological tools that combine cognitive and physical assistance. This combination can empower older patients in rehabilitation processes, as it improves the capacity to acknowledge their own movements in gait training.

In examining technology to enhance social participation among older adults, Marcos Baez, Radoslaw Nielek, Fabio Casati, and Adam Wierzbicki start by reviewing barriers for social participation in later life to then demonstrating how that knowledge informed the design and evaluation of two new technologies: the first, GymCentral, a tablet-based application for virtual group participation in fitness programs, the second, a location-based game for intergenerational activities such as a city tour. These technologies were tested in several European countries, including Italy, Poland, and Russia. The authors discuss the results of their studies in light of challenges and opportunities of social technology use in later life.

We conclude this section with a chapter by Carlos Duarte and José Coelho who walk us through co-design stages of social networking services for older adults. The authors developed interfaces for Facebook, the most used social networking site (SNS), to address issues such as social isolation and loneliness in later life. They address the results of their research in Portugal and the applied co-design process to discuss challenges and opportunities of co-designing emerging technologies for and with older adults.

Reflecting on the overall sections, in addition to complementary approaches to different technologies and topics, this collection also presents several angles to explore similar objects of analysis. For example, participatory design (PD) is

examined from a conceptual (Chap. 2), methodological (Chaps. 7 and 10), ethical (Chap. 11), and empirical perspective (Chaps. 14 and 18). Technology, social participation, and connectedness in later life are studied theoretically (Chaps. 3, 4, and 5), methodologically (Chaps. 7, 8, and 9), ethically (Chaps. 11, 12, and 13), and empirically (Chaps. 17 and 18). Technology and physical exercise are approached theoretically (Chap. 6) and empirically (Chaps. 15, 16, and 17). In terms of specific technologies, for example, digital games are approached theoretically (Chap. 6) and empirically (Chaps. 15 and 17); virtual reality is investigated from a methodological (Chap. 10) and empirical (Chap. 14) standpoint. Web- and tablet-based technologies are explored throughout most chapters, from theoretical, methodological, ethical, and empirical perspectives.

In sum, the book offers unique multidisciplinary insights into technology and ageing, bringing together the knowledge and experience of different disciplines on digital technologies, from design to evaluation. The collection addresses pressing topics in the field—from loneliness to neuropsychological functions in later life—drawing on rich qualitative and quantitative research, cross-cultural cases, and transdisciplinary approaches. The chapters, which cover theoretical, methodological, and real-world issues of working with older adults, provide readers with useful knowledge, guidelines, and practices that transcend particular technologies and can be applied in different contexts and settings.

To our knowledge, this is the first effort to bring together these different approaches in a truly multidisciplinary perspective that spans social sciences, computer science, engineering, design, architecture, and applied sciences. By combining these perspectives, we offer a multidimensional understanding and assessment of the topic and lay the ground for future research and new directions. While the relevance of the specifics of enabling technologies might change over time, we hope the conceptual framings, methods, and experiences presented in this book will endure, providing ongoing guidance for the creation of new technologies that benefit us all as we age.

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