Preface

Welcome to this book of research into ageing and technology. This book covers a broad range of related topics by leading and emerging researchers in the new field of technology innovation for ageing. Chapter authors are from Canada, Germany, UK, Greece, Czech Republic, Korea, Singapore, the USA, Ireland, Spain, the Netherlands, Belgium, Italy, Sri Lanka, Japan, Taiwan and Australia. The topic is an important one, that is, how to enrich the experience of ageing and relieve some of the pressures and stresses associated with an ageing population through intelligent technology and the intelligent use of technology.

There is a movement towards an agenda of active ageing, so the support for older people goes beyond traditional models of "care" to models that promote social participation and active independent lives. Technology is a potentially powerful medium for facilitating this.

The aim of compiling this book was to provide high-quality academic, industry and practice articles in research on intelligent technologies for seniors. The main focus is to provide insights from current research and innovations, to discuss issues to be resolved and approaches for widespread adoption to enable seniors, their families and carers, and wider society to benefit from the many advantages that technology can contribute towards ageing societies.

BACKGROUND

Information and communications technology and the widespread adoption of the Internet have transformed industries, and enabled new services and delivery at the convenience of the consumer. There is a plethora of new sophisticated technologies with the potential to transform ageing and aged care, enable independent living and provide access to care at the convenience of the consumer. There are also exciting projects in many countries involving telecare, telehealth and other technologies that might assist seniors. Demonstrator smart homes can be found in many countries. Governments are beginning to develop strategies and policies to reduce barriers to the adoption of technologies for ageing and promote their adoption. Some of the large-rollouts of intelligent home care technologies are providing confirmation of the anticipated benefits. Researchers have a responsibility to contribute to and disseminate results of the findings of quality research so as to guide policy development, resource allocation and evidence-based decision making.

The technologies promise to alleviate some of the challenges of ageing. These include adverse events such as falls, risks involved in wandering by people with cognitive decline, workforce participation by seniors, maintaining physical activity, maintaining social contacts and involvement, addressing the shortages of professional and family carers, and providing reminders of activities of daily living and medications.

That there is a great need for these technologies is demonstrated by the high rates of adverse events. There are as yet few people living in smart home environments and the adoption of intelligent technology for ageing is slow compared to the adoption of technologies in many other sectors. There are many issues to be resolved before the adoption of intelligent technologies for ageing becomes mainstream and there is much to learn from current research and project experience. Issues include design, acceptance by seniors, design agreement and standards by manufacturers, equipment funding, service funding, business models, maintenance, monitoring, education and training, awareness raising, standards, prioritisation of resources more towards home and community care, confirmation of the benefits and national strategy and policy.

AGEING

The context for this book is the global surge in the percentages of older people in the populations of almost all countries and the imperative to find creative ways to manage growing demand for services, to manage costs and better support people – consumers, families and carers. Older age confronts all of us in different ways throughout life from the experience of ageing grandparents, the move of our own parents into later stages of life and ultimately our own transition into society's senior citizens. Few people would not want the ageing experience to be better for themselves and subsequent generations than it might have been for our grandparents and parents.

Many will be aware of the way technology has transformed our lives in almost every field. It may come as a surprise to people drawn into arrangements to support elderly parents to find out how little technology is used by the current generation of seniors and many of the aged care providers. Technology has the potential to assist in maintaining active, productive and independent lives, support the care workforce, provide access to health and medical services, facilitate social connectivity and assist in countless other ways such as those explained in this book. For this to happen, researchers may have to look at ageing and at people from a fresh perspective.

Exciting innovations in intelligent assistive technologies, smart home environments and information systems to support care in home and community settings have been undertaken internationally. Some of these are presented in this book. Much of these approaches are yet to be mainstreamed, that is to be made available to a broader community beyond projects, pilots or limited roll-outs. To achieve this there is still much to be done in research. Issues that need further development include awareness raising, promotion, improving availability and support, developing systems for responding appropriately to the signals from the technology, funding arrangements and new models for providing care that optimise the potential benefits.

DEVELOPMENT OF THE BOOK

Researchers and practitioners were invited to submit chapter proposals clearly explaining the mission and concerns of their proposed chapters. From these a number were selected on the basis of likely interest to readers, innovation, quality, balance and the research standing of the authors. Authors of accepted proposals were provided with organizational guidelines to assist in the development of full chapters. All submitted chapters were reviewed by at least two reviewers on a blind review basis.

This book of research brings together a range of complementary ideas. It is aimed at contributing to the further development and adoption of assistive technology through quality research. We were delighted with the diversity of chapter proposals submitted for publication and regret that not all could be included.

CONTRIBUTIONS

The book is divided into three thematic sections. Section 1: Innovations supporting ageing in place opens with a chapter on the potential of Ubiquitous Computing for Independent Living from Neil Bergmann. Bergmann suggests that two concurrent strategies are needed to improve the penetration of ICT-based assistive technology in the community. Firstly, significant trials are needed to verify that such systems can provide improved health outcomes and reduce health system costs for suitably targeted patients. Secondly, research in security and privacy, open standards, human-computer interfaces and new models of care driving software specifications is needed, so that these health system benefits can be achieved at a reasonable cost, and with adequate consideration of the needs of clients and carers.

Jeffrey Soar in the chapter, "Ageing, Chronic Disease, Technology and Smart Homes: An Australian Perspective," explores issues of ageing, chronic disease, technology and social change. He suggests a challenge is in providing access to and support for the use of technologies where there are clear benefits to consumers, carers, providers and funders of healthcare. The chapter also reports on the Queensland Smart Home Initiative which is one of several organisations internationally that share a mission of assisting people to be supported through these technologies.

A leading European project on Ambient Assisted Living systems for older people, The SOPRANO Project, is reported on by Andrew Sixsmith and co-authors. The chapter, "A user-driven approach to developing Ambient Assisted Living systems for older people: The SOPRANO Project," outlines SOPRANO's experience and application research approach to ensure that end-users are involved in all stages of the research and development. The chapter reports that in the SOPRANO project a number of key areas for application development were identified and developed as a set of use cases (or descriptive models), for example for medication reminding, and to support exercise. These use cases were further refined through visualization and iterative prototyping techniques with end-users to ensure usability, usefulness and acceptability for users. The SOPRANO prototype system is described together with future plans for deployment in demonstration sites and field trials.

One in three people over the age of 65 experience falls each year, consequently falls prevention is a major issue and is discussed in the book in the chapter "Falls prevention in the home: Challenges for new technologies" by Rose A Kenny, Cliodhna Ni Scanaill and Michael McGrath. They review the latest best practices for the identification of falls risk including the technology available and the challenges of using technology for in-home falls prevention, risk assessment and falls detection. Recommendations and suggestions for future research directions are discussed.

Claire Huijnen presents the research, results and lessons learned from a project to evaluate currently available assisted living technologies for older people with mild to severe memory impairments who want to age in place, in her chapter "The use of assistive technology to support the wellbeing and independence of people with memory impairments." She found that technology did have a positive impact on their lives as well as on the lives of the informal caregivers who often live with those who suffer from amnesia. This chapter gives insight into how we are coming closer to optimizing the positive effects which assistive technology holds for older people with memory impairments.

"Pluggable user interfaces" is a software concept that facilitates adaptation and substitution of user interfaces and their components due to separation of the user interface from backend devices and services. In their chapter, “Meeting the Needs of Diverse User Groups: Benefits and Costs of Pluggable User Interfaces in Designing for Older People and People with Cognitive Impairments.”

Gottfried Zimmerman and co-authors report on experiences in employing pluggable user interfaces in the European project i2home. Their anecdotal evidence supports the claims on the benefits, the costs and some hints as to how to mitigate the costs.

Samuel Cubero describes the mechanical design, manufacture and performance of a three-degree-of-freedom manipulator arm and gripper that can be attached to a mobile vehicle or electric scooter in the chapter “A robotic arm for electric scooters.” This reports on a device that can be remotely or automatically controlled to pick up and retrieve heavy objects, such as books or grocery products, from high shelves or difficult-to-reach locations. Such tasks are often considered to be arduous or even impossible for the frail elderly and people with disabilities. A brief overview of existing “state of the art” robotic and machine vision technologies, and how these can be used to perform many everyday domestic or household chores, is also provided.

Section 2: contains chapters on the theme of Innovations supporting engagement with daily life. In the first chapter in this section Nancy Pachana and Emma Poulsen aim to examine the adoption of technology by older adults within a framework of current gerontological theories and research in their chapter “Thinking Outside the Box: Novel Uses of Technology to Promote Well-being in Older Populations.” Cognitive, physical, mental and interpersonal development and change later in life are described. Two main psychological frameworks for understanding successful ageing are briefly outlined and within these frameworks, the role of technology in enhancing the lives of older adults, regardless of the level at which they incorporate it into their lives, are discussed. The chapter concludes with suggestions for removing barriers and enhancing uptake of technology for older adults, helping to bridge the grey digital divide.

Richard Swindell, Peter Grimbeek and Jan Heffernan in their chapter, “U3A Online and successful aging: A smart way to help bridge the grey digital divide,” set three aims: 1) to outline the elements of the successful aging model; 2) to explain the worldwide, self-help University of the Third Age (U3A) program and 3) to discuss findings from two related studies of older adults who were members of the first virtual U3A called U3A Online. Their focus group research examined the characteristics of older people who are attracted to online learning. Results supported a conclusion that electronic communication can reduce feelings of isolation and provide stimulating and enjoyable pastimes with the potential to assist older people in aging successfully.

Donghee Han and Kathryn L. Braun examined “Promoting Active Ageing through Technology Training in Korea.” Their chapter reviews the Korean situation of ageing, outlines commitment to Active Ageing with Digital Ageing, and presents information on three “best practices” for expanding digital literacy and involvement of older adults. Internet Navigators are older adults trained to train other older adults in the use of computers, the Internet, and various software programs. Cyber-Family links older adults and youth as online pen-pals. The annual1080 Online Game Festival brings three-generation families together for a day of internet play, which has led the Korean IT industry to expand computer and software options for older adults.

Being able to continue to drive a car is of great concern to older people in many societies and Christopher G. Hatherly in his chapter “Intelligent Transportation Systems for Older Drivers: A Systems Approach to Improving Safety and Extending Driving Longevity” covers current and future technologies relevant to

older drivers. It begins with a review of salient characteristics of older drivers, before discussing current and future technologies at the levels of the vehicle, the infrastructure and the individual.

Assistive technology (AT) usage by older people has not increased in proportion to availability and ease of access. This is the finding of John Heng and Subhasis Banerji in their chapter "Low Usage of Intelligent Technologies by the Aged: New Initiatives to Bridge the Digital Divide." This is despite a belief that technology can contribute significantly towards improving their quality-of-life. Their Rehabilitation Mechatronics research group is developing a "unified neuro-physio platform", taking a cue from Eastern philosophies which emphasize that the "internal environment" of the users strongly affects how they interact with the "external environment". They propose a technology platform to help older people to understand and enhance the internal environment in order to interact at various levels with AT in their external environment.

Hong Sun and co-authors discuss the characteristics of Ambient Assisted Living (AAL) to address the needs of older people in the chapter "Building a Mutual Assistance Community for Older Elderly pPeople." They propose combining social aspects with technology to build a community of mutual care which, among other things, can serve as a platform to effectively organize the social resources, promote social connection, and introduce intergenerational activities. Technical issues of building their community through service orientation and web services are discussed. Their research also analyzes the characteristics of a mutual assistance community to help older people age well.

The last chapter in Section 2 is an industry perspective: "Preventative Healthcare: A Proposed Holistic Assistive Technology Model based on Industry Practice" from James Barrientos and Michele Barry. This chapter proposes a preventative healthcare model based on assistive technology to strengthen wellbeing at the individual and community level. The proposed model could minimise premature and inappropriate admission of Australians to care facilities while enhancing their independence and self care. It could also present a cost effective approach for policy makers by helping to alleviate the escalating costs of the health system. Importantly, this program offers an effective and sustainable alternative for delivering future health services.

The last of the three sections of the book contains chapters on the theme of Innovations supporting the frail elderly and aged care providers. Lorenza Tiberio and co-authors begin this section with a chapter on "Attitudes toward intelligent technologies: Older people and caregivers in nursing homes." They explore the role of intelligent technologies as a supplement to human care-giving and the potential to improve quality of life for both older adults and their caregivers in nursing homes. The chapter reports on a study on older people's and caregivers' attitudes toward the use of intelligent technologies in nursing homes, with the aim of understanding in which domains of everyday activities the application of intelligent technologies can be more suitable. Their results showed that attitudes of older people and care-givers toward the application of intelligent technologies in nursing homes is positive, although multifaceted.

José Luis Jorge Marrasé describes the approach followed to create a new communications platform that can support a citizen centric home care service in the chapter Citizen centric care: A Telecom perspective based on Integrated Video Assistance for Elders (IVAE). This strategy is based on offering application enablers to care providers to simplify the use of the capacity of telecom networks. The chapter also discusses the required supporting changes in the care provider systems and procedures to deliver the outcomes needed in healthcare.

Lemai Nguyen in the chapter "Supporting Family-based Care for Aged Patients with Chronic Illness" describes current models in understanding patient and family carer information needs and analyses technology solutions in a new field of consumer health informatics. Her analysis shows that current technology

solutions in consumer health informatics fail to effectively support aged people in their own management of chronic illness and as well fail to support family carers. She also identifies key research issues in developing technologies to support aged patients and family carers in chronic illness management.

Sisira Edirippulige and Rohana Basil Marasinghe undertook a systematic review of randomised controlled trials (RCT) in geriatric telenursing practices telenursing in aged care that is reported in "Telenursing in aged-care: Systematic evidence of practice." They found that robust evidence based on RCTs in aged care telenursing is yet to emerge however the majority of current studies suggest that telenursing is an effective tool.

Seungwon Jeong and Yusuke Inoue in Health insurance systems as models for managing the increasing elderly populations of Japan and Korea report on research into the systems and institutions for older people covered by long-term care insurance in Japan and the Republic of Korea. They discuss the historical changes in policies in these two nations. They found changes occurred in competition between medical facilities for patients and changes in the management and organisational environment of medical facilities.

The book ends with an interesting chapter "Assistive Technologies as aids to family caregivers in Taiwan" by Szu-Yao (Zoe) Wang. She discusses filial piety, the obligation to care for older parents at home, as one of the core tenets of Chinese societies across Asia. Placing older parents into nursing homes can lead to family conflict and can continue to evoke deep emotional responses in some former family caregivers. This chapter draws on findings from two case studies to illustrate the dilemmas facing Taiwanese families who must cope with changing social conditions and customary filial expectations, and potential solution for these dilemmas by using assistive technologies.

Jeffrey Soar
University of Southern Queensland, Australia

Rick Swindell
Griffith University, Australia

Philip Tsang
Caritas Francis Hsu College, Hong Kong