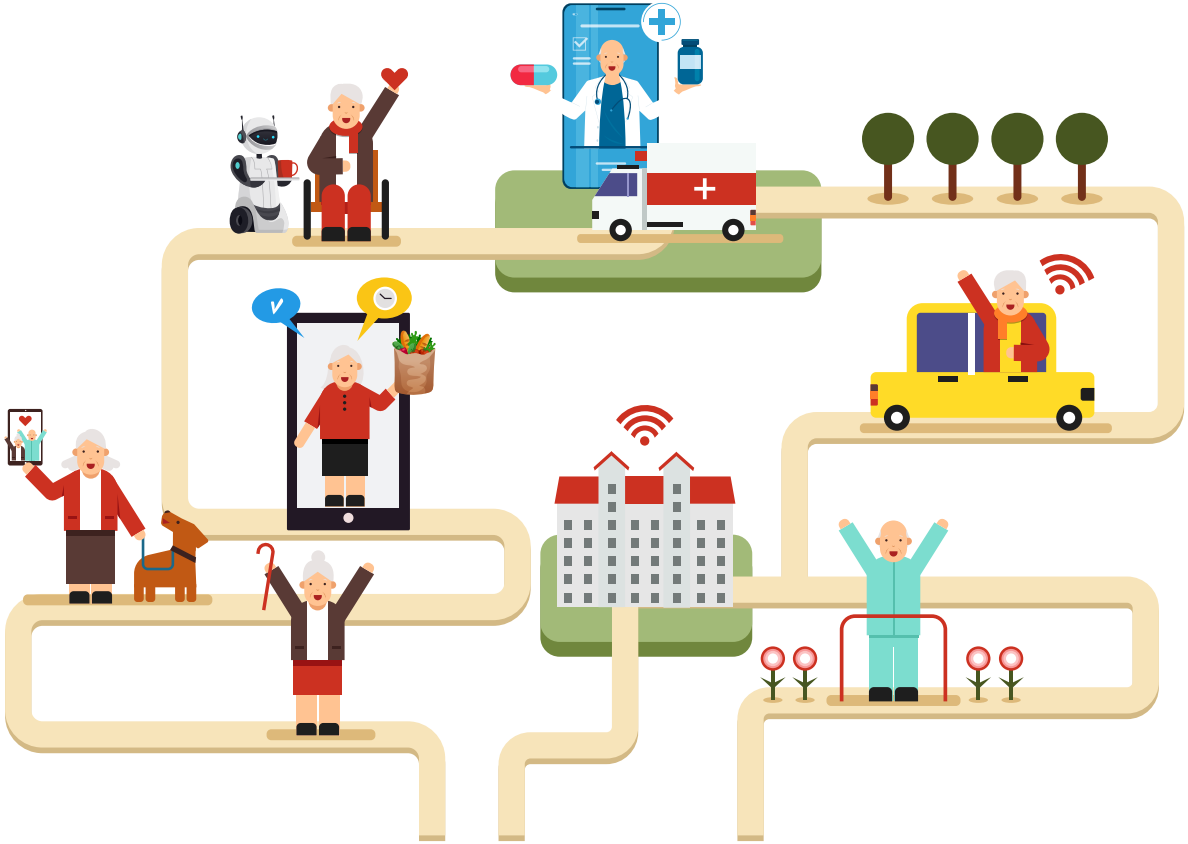


Leveraging Technology for the Madrid International Plan of Action on Ageing: Experiences of China, Japan and the Republic of Korea





*The shaded areas of the map indicate ESCAP members and associate members.**

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Leveraging Technology for the Madrid International Plan of Action on Ageing: Experiences of China, Japan and the Republic of Korea

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Please cite this publication as:

United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2021). *Leveraging Technology for the Madrid International Plan of Action on Ageing: Experiences of China, Japan and the Republic of Korea*.

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Preface

The world is experiencing a rapid demographic transition towards an ageing population. In particular, **North-East Asia is home to around one third of all older persons aged 65 and above in the world**, with the number of older persons in the subregion expected to double from 250 million in 2020 to almost 500 million in 2050. Three countries in the subregion are particularly noteworthy: **China has the largest population of older persons in the world, whereas Japan has the highest proportion of older persons in the world and the Republic of Korea has the fastest rate of population ageing in the world.**

While rising life expectancy is one of humanity's major achievements, population ageing presents unprecedented economic and social challenges. In fact, population ageing is one of the mega trends that affects sustainable development in the world and is particularly relevant to several Sustainable Development Goals (SDGs), including ending poverty (Goal 1), ensuring healthy lives and well-being at all ages (Goal 3), achieving gender equality (Goal 5), promoting full and productive employment and decent work for all (Goal 8), reducing inequalities (Goal 10) and making cities and human settlements inclusive, safe, resilient and sustainable (Goal 11).

An important instrument to overcome the challenges and grasp the opportunities presented by population ageing is the Madrid International Plan of Action on Ageing (MIPAA). To implement the MIPAA, business as usual will not work and innovative solutions are needed, especially given the limited time to prepare for rapid population ageing in the region. **While the 2030 Agenda for Sustainable Development positioned Science, Technology and Innovation (STI) as key means of implementation of the SDGs, STI also plays a key role in the implementation of the MIPAA.** For example, ESCAP's publication "Using Information Communication Technologies to Address the Health Care Needs of Older Persons Managing Chronic Disease: A Guidebook and Best Practices from Asia and the Pacific" provides in-depth analysis on the role of technology in enabling equitable access to high quality health care services to older persons.

To complement existing works, **this report aims to identify good practices on utilizing technology to support older persons around the three priority directions of the MIPAA and discuss effective policy interventions in promoting the development of technology for ageing societies, based on the experiences of the three leaders in STI in the subregion (i.e., China, Japan and the Republic of Korea).** The findings and recommendations will provide timely contributions to the fourth review and appraisal of the MIPAA and serve as substantive component of work on STI for SDGs.

The analysis follows the framework of the MIPAA, showing concrete examples of how technology could be leveraged to accelerate the implementation of the MIPAA (Chapter II). References and suggestions for the development of national policy framework and (sub)regional cooperation on technology for active ageing will also be provided (Chapters III and IV). **Through the sharing of experiences, this report supports countries within and beyond the subregion to address the challenges and grasp the opportunities of population ageing with the help of STI.**

Acknowledgements

This report was prepared by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), in partnership with the following organizations: China National Committee on Ageing (CNCA), China Research Center on Ageing (CRCA), United Nations Population Fund (UNFPA) China, Our Hong Kong Foundation (OHKF), Japan Center for International Exchange (JCIE) and Korea Advanced Institute of Science and Technology (KAIST).

Under the overall direction and guidance of Ganbold Baasanjav, Head of ESCAP East and North-East Asia Office and the supervision of Sangmin Nam, Deputy Head of the Office, Wai Kit Si Tou led the drafting of the report and coordinated inputs from partners. The report has also benefited from useful comments and suggestions offered by Srinivas Tata, Sabine Henning, Vanessa Steinmayer, Jeonkyoung Cha and Channarith Meng of Social Development Division, ESCAP. Infographics were prepared by Maripha Siripool (intern).



CNCA, CRCA and UNFPA China contributed their expertise in technology for active ageing and related policy research in China.



OUR HONG KONG
FOUNDATION
團結香港基金

At OHKF, under the leadership of Stephen Wong, Senior Vice President and Executive Director of Public Policy Institute, a team including Kenny Shui, Johnson Kong, Jessica Tan and Arthur Tsang, contributed their expertise in policy research and co-authored Chapters III and IV. The team conducted in-depth analysis on policies that promote the development of technology for active ageing. The contribution of Melvin Kan, Wavian Li and Jamie King towards this research is also appreciated.



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日本国際交流センター

At JCIE, Kim Gould Ashizawa, Stephen McHugh and Momoko Abe contributed to the Japanese case studies of technology for active ageing in Chapter II.



At KAIST, Moon Jeong Choi provided valuable inputs regarding the experience of the Republic of Korea, especially on the application of technology to accelerate the implementation of the MIPAA in Chapter II.

Valuable comments and suggestions were received from Rintaro Mori, Regional Advisor on Population Ageing and Sustainable Development, UNFPA Asia and the Pacific Regional Office, Paul Cheh, Deputy Secretary General for External Affairs, Thailand National Health Foundation, Jiyoung Suh, Research Fellow, Science and Technology Policy Institute (STEP) and Sunghee Chung, Lecturer, The Chinese University of Hong Kong.

Layout and cover design for this report were provided by DocuFriends.

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PROMOTING ACTIVE AGEING FOR SUSTAINABLE DEVELOPMENT

North-East Asia is home to one third of all older persons aged 65 and above in the world



Largest population of older persons



Highest percentage of older persons



Fastest rate of population ageing

Population ageing presents unprecedented economic and social challenges, affecting sustainable development in the world, in particular:



Poverty of older persons



Healthcare of older persons



Higher risk of poverty for older women



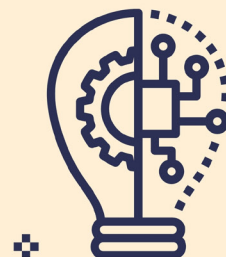
Decent work for older persons



Old-age economic inequalities



Age-friendly living environment



Science, Technology and Innovation (STI), as a key means for achieving sustainable development, plays an important role in accelerating the implementation of the Madrid International Plan of Action on Ageing (MIPAA).

Chapter I. Introduction

A. Overview of Population Ageing in North-East Asia

The world is experiencing a demographic transition at an unprecedented pace, with profound changes in the age structure of population. In particular, **population is ageing rapidly in North-East Asia**. According to United Nations¹, **the subregion is home to around one third of all older persons aged 65 and above in the world**, with the number of older persons in the

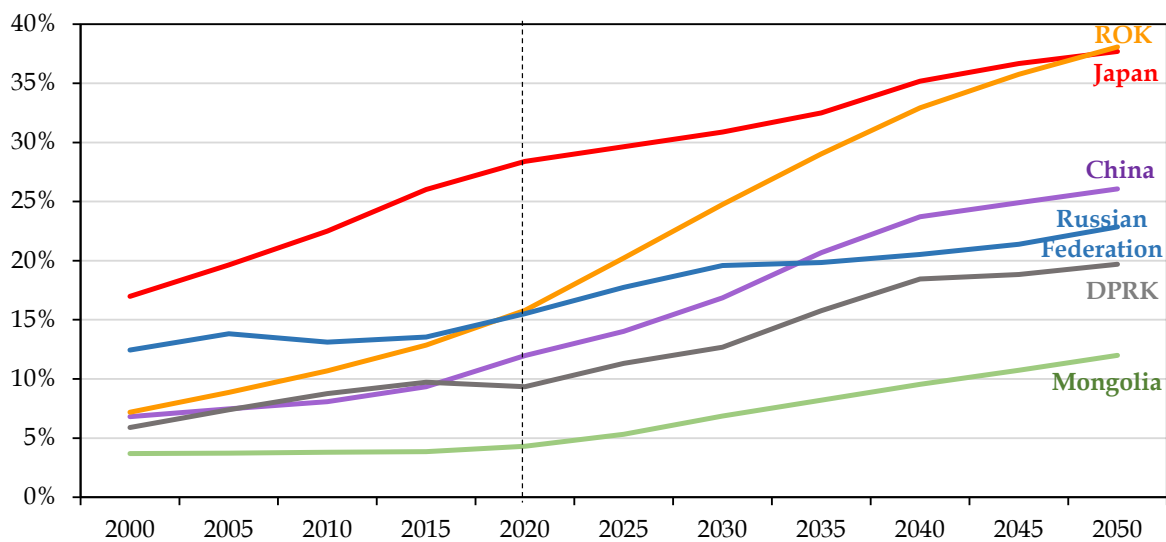


subregion expected to double from 250 million in 2020 to almost 500 million in 2050.

Three countries within the subregion are particularly noteworthy. **China has the largest population of older persons in the world, whereas Japan has the highest proportion of older persons in the world and the Republic of Korea (ROK) has the fastest rate of population ageing in the world.**²

Behind the demographic transition, countries in the subregion recorded across-the-board increase in life expectancy thanks to sustained improvement of living quality and this trend is expected to continue (Figure 1.2). On the other hand, there has been a sharp decline in fertility (Figure 1.3). Except for Mongolia, the fertility

Figure 1.1 Share of population aged 65 and above



Source: United Nations (2019). *2019 Revision of World Population Prospects*. Available at <https://population.un.org/wpp/>

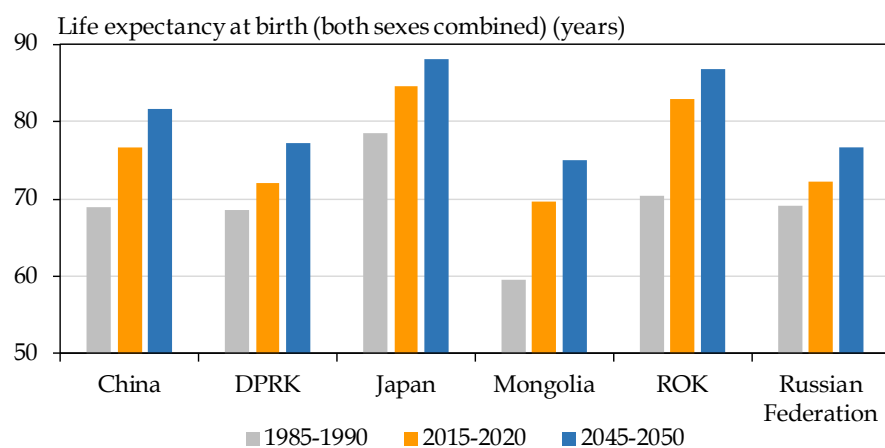
1 United Nations (2019). *2019 Revision of World Population Prospects*. Available at <https://population.un.org/wpp/>

2 For comparison, the proportion of older persons aged 65 and above in France shifted from 10% of the total population to 20% in about 70 years, while Japan experienced the same shift in just 20 years and China and the Republic of Korea are estimated to undergo the transition in less than 20 years.

rates of all countries in the subregion are below the replacement level (i.e., the fertility rate required to keep the population the same from generation to generation). **Given the longer life expectancy and lower fertility rate, China, Japan and the Republic of Korea stand out in the subregion with monumental**

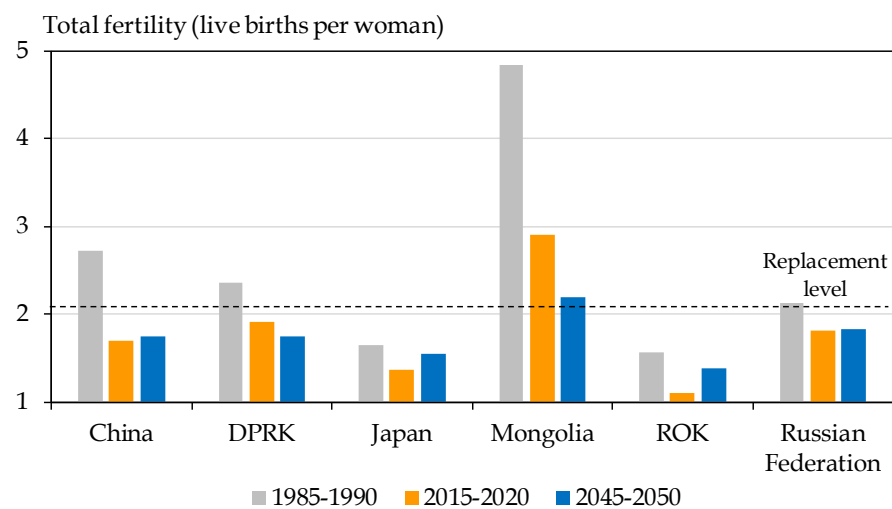
demographic shifts. Among various concerns, the demographic shift raises questions on each country's capacity to sustain economic growth, maintain fiscal sustainability and increase general welfare for all ages.

Figure 1.2 Life expectancy at birth



Source United Nations (2019). *2019 Revision of World Population Prospects*. Available at <https://population.un.org/wpp/>

Figure 1.3 Fertility rate



Source United Nations (2019). *2019 Revision of World Population Prospects*. Available at <https://population.un.org/wpp/>

B. Population Ageing and Sustainable Development

While rising life expectancy is one of humanity's major achievements, population ageing presents unprecedented economic and social challenges. On the economic front, an ageing society with shrinking labour force drags down investment and productivity growth. The situation becomes more challenging when population starts to decline as it could result in a structural slowdown on economic development. In addition, the rise in the old-age dependency ratio and increase in the average life expectancy add pressure to pension finances amid decline in taxation revenues. As society ages, the increasing demand for health care and long-term care places further burden on fiscal sustainability. To ensure sustainable development, population dynamics must be taken into account in national development strategies and plans.

On the social front, ageing is associated with a proliferation of various forms of non-communicable chronic disease, which increases the demand of health care and long-term care. When social and economic supports begin to wane with the progression of age, older people (especially women) become more vulnerable to the onset of poverty. They are also likely

to experience situations of social stress and suffer from feelings of emptiness, loneliness and despair.

Having said that, **older persons are invaluable assets to society**. With the accumulation of knowledge, skills, social capital, etc., older persons could play an active role in the economic, social, cultural and political spheres, continuing to contribute to society and sustainable development. For instance, older persons can transfer their intangible assets to younger generations, strengthening intergenerational solidarity. Older persons can also participate in voluntary activities and community works, promoting multigenerational support and interaction.

Population ageing and older persons are directly addressed in several of the Sustainable Development Goals (SDGs), particularly in Goal 1 "End poverty in all its forms everywhere", Goal 3 "Ensure healthy lives and promote well-being for all at all ages", Goal 5 "Achieve gender equality and empower all women and girls", Goal 8 "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all", Goal 10 "Reduce inequality within and among all countries" and Goal 11 "Make cities and human settlements inclusive, safe, resilient and sustainable" (Figure 1.4).

Figure 1.4 Close linkage between population ageing and sustainable development



Population ageing is one of the mega trends affecting sustainable development in the world. It has implications for nearly all sectors of society. Preparing for the economic and social shifts associated with an ageing population is essential to ensure the achievement of the 2030 Agenda for Sustainable Development which puts inclusion at the centre of the agenda with a focus on reducing inequality, reaching all population groups and leaving no one behind.

C. The Madrid International Plan of Action on Ageing and the Sustainable Development Goals



An important instrument to overcome the challenges and grasp the opportunities presented by population ageing is the Madrid International Plan of Action on Ageing (MIPAA). Adopted at the Second World

Assembly on Ageing in April 2002, the MIPAA is the main international framework for building societies for all ages. It provides a comprehensive set of objectives and actions to address population ageing and protect the rights of older persons. A systematic review and appraisal of the MIPAA takes place every five years, with the fourth round starting in 2021.

The 2030 Agenda for Sustainable Development aligns with the MIPAA and its priority directions. The

MIPAA is structured around three priority directions (i) older persons and development; (ii) advancing health and well-being into old age; and (iii) ensuring enabling and supportive environments. Table 1.1 shows the key issues identified under each priority direction. **Implementing the MIPAA complements and contributes to achieving the 2030 Agenda.**

ESCAP recognizes the importance of Science, Technology and Innovation (STI) in achieving the 2030 Agenda for Sustainable Development as well as the role that technology plays in population ageing as mentioned in the MIPAA.³

The Third Review and Appraisal of the MIPAA in Asia and the Pacific also acknowledged the important role of STI in the implementation of the MIPAA and highlighted the need to (i) expand and



harness scientific research, expertise and technology to address the social and health implications of ageing, (ii) encourage and promote holistic research and development on ageing, including innovative information and communications technologies for older persons and (iii) encourage the harnessing of scientific research and expertise and to realize the potential of technology to focus on, inter alia, the individual, economic, social and health implications of ageing, in particular in developing countries.⁴

³ United Nations Economic and Social Commission for Asia and the Pacific (2016). *Resolution adopted by the Economic and Social Commission for Asia and the Pacific*. Available at https://www.unescap.org/sites/default/files/E72_RES12E.pdf

⁴ United Nations Economic and Social Commission for Asia and the Pacific (2017). *Report of the Asia-Pacific Intergovernmental Meeting on the Third Review and Appraisal of the Madrid International Plan of Action on Ageing*. Available at https://www.unescap.org/sites/default/files/AgeingMeetingReport_DEC18.pdf

Table 1.1 Key issues identified by the Madrid International Plan of Action on Ageing

Priority direction I: Older persons and development
Issue I-1: Active participation in society and development
Issue I-2: Work and the ageing labour force
Issue I-3: Rural development, migration and urbanization
Issue I-4: Access to knowledge, education and training
Issue I-5: Intergenerational solidarity
Issue I-6: Eradication of poverty
Issue I-7: Income security, social protection/social security and poverty prevention
Issue I-8: Emergency situations
Priority direction II: Advancing health and well-being into old age
Issue II-1: Health promotion and well-being throughout life
Issue II-2: Universal and equal access to health-care services
Issue II-3: Older persons and HIV/AIDS
Issue II-4: Training of care providers and health professionals
Issue II-5: Mental health needs of older persons
Issue II-6: Older persons and disabilities
Priority direction III: Ensuring enabling and supportive environments
Issue III-1: Housing and the living environment
Issue III-2: Care and support for caregivers
Issue III-3: Neglect, abuse and violence
Issue III-4: Images of ageing

Source United Nations (2002). *Political Declaration and Madrid International Plan of Action on Ageing*. Available at <https://www.un.org/esa/socdev/documents/ageing/MIPAA/political-declaration-en.pdf>

ESCAP's publication "Using Information Communication Technologies to Address the Health Care Needs of Older Persons Managing Chronic Disease: A Guidebook and Best Practices from Asia and the Pacific" highlights the role of technology in enabling equitable access to high quality health care services to older persons. It provides examples of regional best practices and proposes a comprehensive policymaker checklist to support

policymakers to develop country-specific approaches and foster ICT-enhanced health care systems.

To complement existing works, **this report focuses on the experiences of the three leaders in STI in the subregion (i.e., China, Japan and the Republic of Korea)⁵, showcasing good practices on utilizing technology to support older persons** (the so-

⁵ China, Japan and the Republic of Korea ranked 2nd, 3rd and 5th, respectively, in terms of value added in the ICT sector in the world. These three countries are pioneering the trend of digitalization in Asia and they have a significant impact on the transformation to digital societies globally. They have also been promoting technology for active ageing in recent years.

called gerontechnology) **around the three priority directions of the MIPAA and discussing effective policy interventions in promoting the development of technology for ageing societies.** Through the sharing of experiences, this report supports member States in the subregion and beyond to address the challenges and grasp the opportunities of population ageing with the help of STI.

According to the Commission for Social Development, the proposed timeline for the fourth review and appraisal of the implementation of the MIPAA is as follows: national reviews and appraisals in 2021, regional review processes in 2022 and global review by the Commission for Social Development at its sixty-first session in 2023.⁶ **The findings and recommendations of this report will provide timely contributions to the fourth review and appraisal of the MIPAA, illustrating how technology could be leveraged to implement the MIPAA as well as providing references for the development of national policy framework and (sub)regional cooperation on technology for active ageing.** The analysis will also serve as substantive work on STI for SDGs, building concrete cases on how technology could accelerate the achievement of the SDGs, especially in relation to the issue of population ageing.

D. Impact of the COVID-19 Pandemic on Older Persons

Before moving to the case studies for utilizing tech-

nology to support older persons, it is important to analyze the impact of the COVID-19 pandemic on older persons.

The COVID-19 pandemic has brought unprecedented challenges to the world and older people face the most serious threats. The crisis changes the socio-economic life of older persons, poses a high risk to their health and well-being and impedes their ability to stay active and socially connected.⁷

Regarding the first priority direction of the MIPAA, i.e., older persons and development, **older persons are more susceptible to adverse socio-economic impacts of COVID-19.** They are more likely to suffer job losses due to the economic downturn caused by the pandemic. **While it is difficult for older persons to re-enter the labour market, the pandemic may permanently undermine their future economic security.** Without a job, older persons may face higher cost of health insurance which makes them further vulnerable amid the pandemic. The risk of old age poverty is more pronounced in countries with inadequate social protection coverage.

Physical distancing should not lead to social isolation and marginalization of older persons. Older persons, as valuable members of our societies, should be able to continue to play active roles in society during the pandemic, e.g., offer social care to family members and those in more disadvantaged situation, contribute to volunteer work in the community and share

⁶ United Nations Economic and Social Council (2020). *Resolution adopted by the Economic and Social Council on 18 June 2020*. Available at https://www.un.org/ga/search/view_doc.asp?symbol=E/RES/2020/8

⁷ United Nations (2020). *Policy Brief The Impact of COVID-19 on older persons*. Available at <https://unsdg.un.org/sites/default/files/2020-05/Policy-Brief-The-Impact-of-COVID-19-on-Older-Persons.pdf>

experiences and skills with the younger generations. In this regard, **technology helps overcome the social and mental barriers of physical distancing, enabling older persons to stay economically productive and socially engaged as well as strengthening social inclusion and solidarity.**

As for the second priority direction of the MIPAA, i.e., advancing health and well-being into old age, **older persons have been disproportionately affected by the pandemic, with higher risk of serious illness and death from the COVID-19 disease.**⁸ While the underlying health conditions make older persons more vulnerable to the disease, concerns have been raised on the use of scarce medical resources based on age. Among various barriers in accessing quality health care during the difficult time when older persons are at most need of care and support, age-based discrimination in the provision of services aggravates their vulnerabilities. Apart from the immediate impact on physical health, **the pandemic also affects the mental well-being of older persons,** especially given the lack of support due to isolation measures.⁹ In fact, the disruption to health care services, age-based discrimination and social isolation brought by the COVID-19 pandemic may have greater secondary impacts to the health and well-being of older persons than the virus itself.¹⁰ In view of these challenges, **technological advancement helps fight the pandemic by supporting the provision of health**

care and other services.

Lastly, under the third priority direction of the MIPAA, i.e., ensuring enabling and supportive environments, older people have been subject to stricter isolation measures than other population groups as they are at particular risk from COVID-19. **Being confined at home for long periods of time can put older people, especially women, at increased risk of domestic violence, abuse and neglect.**¹¹ It also exacerbates the negative impacts discussed above and prevented them from playing their multiple roles in society. In addition, **physical distancing makes it more difficult for older persons to obtain information on the virus and to engage with the community,** given that many are unfamiliar with or have no access to computers and smartphones. Digital divide impedes older persons access to services such as telemedicine, online shopping and banking. These can lead to increased levels of worry, anxiety and isolation, as well as a sense of disempowerment, undermining their mental and physical health.

Given the highly contagious nature of COVID-19, improvement in housing and environmental design is much needed to better support older persons while preventing the spread of virus. In particular, older persons living in long-term care facilities have a higher risk for infection as they live in close proximity to others. Infection prevention and control measures

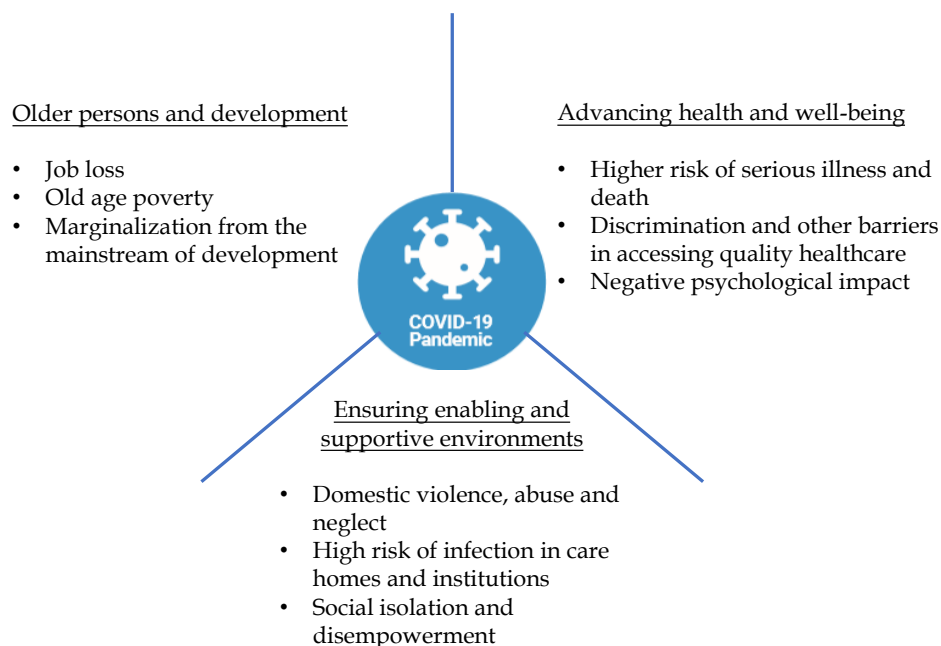
8 United Nations Population Fund (2020). *Implications of COVID-19 for Older Persons Responding to the Pandemic*. Available at <https://www.unfpa.org/resources/implications-covid-19-older-persons-responding-pandemic>

9 Public discourses that portray COVID-19 as a disease of older people can lead to social stigma and stereotypes.

10 HelpAge International (2020). *The impact of COVID-19 on older persons Asia Pacific regional report June 2020*. Available at http://plaza.umin.ac.jp/~naoki_kondo/wordpress/wp-content/uploads/2020/07/Regional-COVID-19-monitoring-report-June-2020_B-1-5.pdf

11 HelpAge International (2020). *Abuse and neglect of older people around the world intensified by COVID-19*. Available at <https://www.helpage.org/newsroom/latest-news/neglect-and-abuse-of-older-people-around-the-world-intensified-by-covid19/>

Figure 1.5 Impact of COVID-19 on older persons



are critical to protect both older persons and health care personnel, yet the measures should also take into account the physical and mental needs of older persons. In this regard, **technology could help reinvigorate the design of housing, institutions and communities as well as assist caregivers to deliver various support and care services to older persons.**

The COVID-19 pandemic offers an opportunity for countries to build their resilience and reduce inequality. Although the virus does not discriminate between the rich and the poor, young people and older persons, it has more significant impacts on the vulnerable populations, propagating new layers of

inequality. The costs of neglecting these vulnerable populations will not only weigh on economic development, but also cause higher rates of transmission and slower recovery. The devastating socio-economic impact of COVID-19 on older persons has to be addressed in both the crisis and the recovery phase. As highlighted by the World Health Organization (WHO) in the 10 Priorities Towards a Decade of Healthy Ageing, the first priority is about establishing a platform for innovation and change to draw on the available innovative practices on ageing.¹²

To build back better and provide better support to older persons, technology and innovation is one of the most promising answers.

12 World Health Organization (2017). *10 Priorities for a Decade of Action on Healthy Ageing*. Available at <https://www.who.int/ageing/10-priorities/en/>



Chapter I. Introduction

Leveraging Technology for the Madrid International Plan of Action on Ageing: Experiences of China, Japan and the Republic of Korea

UTILIZING TECHNOLOGY TO ACCELERATE THE IMPLEMENTATION OF THE MIPAA



THE MADRID INTERNATIONAL PLAN OF ACTION ON AGEING (MIPAA)



1. OLDER PERSONS AND DEVELOPMENT



2. ADVANCING HEALTH AND WELL-BEING INTO OLD AGE



3. ENSURING ENABLING AND SUPPORTIVE ENVIRONMENTS

CASE STUDIES FROM CHINA, JAPAN AND THE REPUBLIC OF KOREA

CAUA
DISTANCE EDUCATION NETWORK

SEOUL 50+
A PLATFORM FOR PROMOTING SOCIAL PARTICIPATION

HYODO PHONE

ZHOUIADU STREET
AI SERVICE CENTER FOR OLDER PERSONS

TELEMEDICINE-BASED MEDICAL AND DAILY CARE SERVICE

XIKANG CLOUD-BASED HEALTH MONITORING AND MANAGEMENT SYSTEM

ANSHINNET
AN AI HEALTH MANAGEMENT SYSTEM

DFREE
AN ICT DEVICE FOR BLADDER FUNCTION

THE IWAKI HEALTH PROMOTION PROJECT

HYODOL
AN AI COMPANION ROBOT

WEIHAI
VIRTUAL NURSING HOME

PERSONAL EMERGENCY LINK SERVICE

LASHIC
A COMMUNITY-BASED ELDERLY SUPPORT PROJECT UTILIZING IOT

EMERGENCY SAFETY AND SECURITY SERVICE

TECHNOLOGY FOR ACTIVE AGEING

Chapter II. Utilizing Technology to Accelerate the Implementation of the MIPAA

Technology plays an important role in supporting older persons and accelerating the implementation of the MIPAA. For example, **technology helps older persons stay economically and socially active, improves their health and well-being and enables them to live independently with dignity.** Depending on the specific needs of older persons, technology could be customized to provide a wide range of support, from enabling them to participate in productive activities and connect with society to enhancing social inclusiveness and intergenerational solidarity, from monitoring their health conditions to providing diversified medical and care services, from helping them age comfortably at home to offering

immediate assistance in case of accident or injury. More importantly, **technology plays a critical role in effective national responses that render the necessary support to older persons during times of crisis and emergency** (e.g., the COVID-19 pandemic).



Based on the experiences of China, Japan and the Republic of Korea, this Chapter presents some case studies for utilizing technology to support older persons. The analysis follows the framework of the MIPAA, showing concrete cases on how technology could be leveraged to accelerate the implementation of the MIPAA around the three

Table 2.1 Case studies of technology for active ageing

	China	Japan	ROK
I: Older Persons and Development	1. CAUA Distance Education Network		2. Seoul 50+, a platform for promoting social participation; 3. Hyodo phone
II: Advancing health and well-being into old age	4. Zhoujiadu Street AI Service Center for Older Persons; 5. Telemedicine-based medical and daily care service; 6. Xikang cloud-based health monitoring and management system	7. AnshinNet, an AI health management system; 8. DFree, an ICT device for bladder function; 9. The Iwaki Health Promotion Project	10. Hyodol, an AI companion robot
III: Ensuring enabling and supportive environments	11. Weihai Virtual Nursing Home; 12. Personal Emergency Link Service	13. LASHIC, a community-based elderly support project utilizing IoT	14. Emergency Safety and Security Service

priority directions. While the advancement of technology enables revolutionary changes (e.g., 3D printing for artificial organs, nanotechnology for genetic engineering, etc.), **the case studies focus on well-tested approaches with high scalability, including low-tech but innovative solutions, that offer effective support to older persons** (Table 2.1). Contextual backgrounds of the development and deployment of technology as well as opportunities and challenges for scale-up are highlighted for the references of interested stakeholders.

A. Older Persons and Development



The first priority direction of the MIPAA is older persons and development. It covers eight key issues (Table 2.2). **The core principle is that older persons must be full participants in the development process and share in its benefits.** It is important to ensure the continuous integration and empowerment of older

persons to prevent them from being marginalized from the mainstream of development.

Despite the extraordinary opportunities presented by technological advancements, one should be aware of the new dimension of inequality the digitally empowered and the digitally deprived. **In view of the digital divide** (i.e., disparities between different demographics with regards to the access and use of technology), **it is crucial to ensure older persons are not being left behind in the Fourth Industrial Revolution.** With appropriate support, older persons could adapt to technological changes and benefit from the increasing availability of new technologies. Higher demand for technologies from the ageing populations could also drive the development of technologies for older persons, creating a virtuous cycle. **The case studies below discuss how technology enables older persons to stay economically productive and socially engaged.**

Table 2.2 Key issues under priority direction I of the MIPAA

Issue I-1: Active participation in society and development
Issue I-2: Work and the ageing labour force
Issue I-3: Rural development, migration and urbanization
Issue I-4: Access to knowledge, education and training
Issue I-5: Intergenerational solidarity
Issue I-6: Eradication of poverty
Issue I-7: Income security, social protection/social security and poverty prevention
Issue I-8: Emergency situations

Source United Nations (2002). *Political Declaration and Madrid International Plan of Action on Ageing*. Available at <https://www.un.org/esa/socdev/documents/ageing/MIPAA/political-declaration-en.pdf>

Case Study 1: CAUA Distance Education Network (China)

Organization: China Association of the Universities for the Aged (CAUA)

Date: 2018 – present

Problem statement: Older persons have diversified demands for learning, which puts forward challenges in the supply of quality education resources, especially in rural areas.

Brief description: In recent years, education for older persons has developed rapidly in China, which has contributed to their more active involvement in society. Distance education has proved to be an effective way to address the fast-growing learning demands of older persons, especially in rural areas.

How does it work: Distance education courses are offered to older students in different provinces and municipalities in line with their preferences and demands. These courses feature great varieties and targeted content, with materials being continuously updated and enriched. In addition to conventional courses, new courses are added according to the demands of older persons. For example, distance old-age education courses in Shanghai cover 14 categories, including calligraphy and painting, health care, vocal music and agricultural cultivation.

Figure 2.1 Online course on tea tasting



Source CAUA (https://www.caua1988.com/#/old_age_education/11/139/1)

The content of distance old-age education courses differs across provinces and municipalities, depending on local politics, economy and living conditions. In Shanghai, the three most popular courses cover health care, mental health and rural politics, whereas in Shandong, the three most popular courses are about agricultural technology, business startup and health care.

Contextual backgrounds of the development and deployment of technology: Distance education and teaching centers for older persons are established by grassroots old-age schools, learning centers for Party members, community learning centers and other similar establishments.

Investments have been made to standardize and modernize distance education terminals. Projectors, large screens, laptops and other distance education facilities are installed in both town-level and village-level old-age schools in a unified effort, so that even older persons living in villages could attend lectures given by nationally renowned experts through the distance learning system.

A comprehensive distance education network involves four core functions, namely online learning, resource services, interactive sharing, as well as data and statistics, to promote the inclusion of technology into the whole process of old-age education and teaching as well as the integration of online and offline teaching.

Impacts: Distance education has proved to encourage old-age education in both urban and rural areas, thereby improving social participation and well-being of older persons. High quality urban resources are effectively introduced to rural areas, which help narrow the gap between urban and rural areas of old-age education as well as promote rural revitalization. The courses are developed in line with local conditions. They enrich both the spiritual and cultural lives of older persons and in some cases, assist in landing new income sources. According to a nationwide survey conducted by CAUA in 2019, 1,276,168 people have participated in distance learning, including 1,082,931 from urban areas and 193,237 from rural areas.

In response to the COVID-19 pandemic, CAUA has offered free access to its students. Apart from computer terminals, a WeChat public account and an APP were launched. The mobile terminals have synchronized their data with the PC terminals to meet users' multi-terminal learning needs, facilitating learning anytime, anywhere.

Lessons learned: The success of distance-education-supported rural development strategy benefits from development of "Internet + distance education" that enhances coverage and influence. However, there are still issues to be worked out, such as inadequate digital infrastructure in rural areas, digital divide and even

digital poverty among older people, as well as different demands for course materials from different areas. In the future, to extend the services to cover more older persons, courses shall be introduced in line with political, economic and social development and meet social participation demands of older persons.

Opportunities and challenges for scale-up: To build a high-quality service platform covering remote rural areas and facilitating lifelong learning for all people, efforts should be made to integrate resources of rural communities and develop high-quality digital learning resource databases. In terms of challenges, the digital infrastructure construction cost has to be shared among the government and the community and the digital divide of older persons must be resolved.

Reference: <https://www.caua1988.com/#/wsIdx/0>

Case Study 2: Seoul 50+, a platform for promoting social participation (Republic of Korea)

Organization: Seoul 50 Plus Foundation

Date: 2016 – present

Problem statement: The Republic of Korea has the fastest rate of population ageing in the world, with a rapidly growing number of older persons. Meanwhile, people aged between 50 and 64 is the largest population group in Seoul. Their roles and contributions to society throughout the life course have become an important issue for the sustainability of society.

Brief description: The Seoul 50 Plus Foundation was established in 2016 with the aim of building an innovative platform for promoting social participation of the 50+ generation and providing support and services for their transition to old age. The strategic plan of the Foundation focuses on the following four key pillars (i) 50+ campus offering comprehensive services for the transition from middle age to old age, (ii) the development of a 50+ work model, (iii) the development of 50+ customized policies and (iv) the promotion of a new 50+ culture.

How does it work: The Foundation operates programs at six campuses and 19 centers, offering comprehensive supports to the 50+ generation, including counselling, transition training programs and community activities. For example, customized life planning services are provided, covering seven areas of life (i.e., job, social contribution, family relationships, social network, leisure, finances and health). Training programs with technology content suitable for the 50+ generation (e.g., how to create YouTube videos and to use social networking services) are also offered to improve users' digital skills and support them in adapting to new technology in everyday life.

The Foundation has a strong focus on supporting the career transformation of the 50+ generation. Through public and private partnerships, the Foundation helps match the expertise and experience of the 50+ generation with opportunities in volunteer activities, jobs and startups via online and offline support systems. The Foundation operates job platforms including an online talent database to facilitate an effective support system. It also promotes the “encore career” — a second vocation beginning in the latter half of life — to help the 50+ generation fulfill individual goals for achievement and social contributions. The Foundation offers office space and internship opportunities to support their members in encore transformation.

Figure 2.2 Online platform of Seoul 50+ rewarding job program

Seoul 50+ rewarding job business operation guidelines

The Seoul 50+ Rewarding Jobs Project is promoted to provide social contribution jobs to 50+ generations of Seoul with social experience and expertise to support continuous opportunities for social participation and vital and stable later life.
 <Basis for Promotion: Article 4 of the Ordinance on Support for Life Transplantation, etc.>

[Common operating instruction file download]

Recruitment status: all
 Recruitment period: YYYY-MM-DD ~ YYYY-MM-DD
 keyword: all
 Please enter in keyword form according to the search type.

Search

Confirmation of the success of the Seoul 50+ rewarding job program

Source Seoul 50+ (<https://50plus.or.kr/applst.do>)

The Foundation also organizes campaigns and activities to improve intergenerational relationships and to raise awareness of issues affecting the 50+ generation. The online portal site (<https://50plus.or.kr>) plays an important role in providing information to the members and spreading a new 50+ culture through policy research.

Contextual backgrounds of the development and deployment of technology: Before the Foundation was fully launched, several smaller-scale programs were implemented and tested. After a thorough evaluation and assessment, the Foundation and its operating bodies were established. The Foundation was founded and continues to be supported by the Seoul Special City under “Ordinance on Establishment and Operation of the Seoul 50 Plus Foundation Laws and Acts”.

The well-designed portal site plays an important role in connecting with its members, disseminating the information and educational content. Also, the Foundation uses social networking services to maximize its impacts.

Impacts: Based on the 2019 annual report released by the Foundation, a total of 356,915 persons visited the 50+ campuses and 27,685 counseling sessions were held in 2019. As for digital impact, a total of 1,155,261 visits to the website were recorded and the portal site has 44,592 members.

Lessons learned: The online portal site has proved to be an effective channel of communication between the Foundation and its members, especially during the COVID-19 pandemic. With comprehensive support measures, the online portal site provides the 50+ generation with access to information as well as an opportunity to improve their digital skills.

When people think about solutions for challenges related to population aging, they often focus only on older persons. However, one of the lessons from the success of the Foundation is that it is important to train and educate future older persons to facilitate a smooth life transition.

Opportunities and challenges for scale-up: Given the rapidly ageing population in the Republic of Korea, the number of people in the 50+ generation increases every year, creating a strong demand for services from the Foundation. In view of the COVID-19 pandemic, one of the challenges is how to move offline events online while maintaining members’ active engagement.

Reference: <https://50plus.or.kr/org/eng.do>

Case Study 3: Hyodo phone (Republic of Korea)

Organization: Mobile companies

Date: 2006 – present

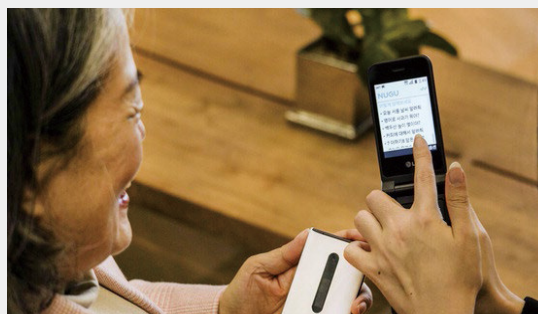
Problem statement: The Republic of Korea is one of the leading countries in the field of information and communication technology (ICT), with approximately 95% of the population owning smartphones.¹³ However, based on the Report on the Digital Divide released by the National Information Society Agency (2019), older persons are most left behind in the transition to the digital age.

Brief description: Hyodo phones are mobile phones designed for older persons. “Hyodo” means filial piety in Korean, which implies that it is a gift presented to parents by their children. A variety of Hyodo phones are available on the market from a very simple flip phone to a smartphone, with selective convenience features for older persons.

How does it work: Hyodo phones generally include only a few primary functions necessary for older persons’ daily activities such as making a call, texting messages, listening to the radio and surfing the internet. They have large buttons as well as large fonts on the display, which help older persons use them easily.

Hyodo phones are very affordable compared to other mobile phones given the simple design and basic functions. Hyodo phones are equipped with special features for older persons. For example, emergency alarm functions are available with an SOS button on the back of the phone. When the user pushes the button in case of emergency, the device will automatically send the user’s location to a pre-registered number. In addition, many new features have been introduced by mobile services companies. For instance, in 2020, SK Telecom company, one of the two largest mobile service providers in the Republic of Korea, added a voice-controlled AI assistant service to Hyodo phones.

Figure 2.3 Hyodo phone provided by SK Telecom



Source SK Telecom.

13 Pew Research Center (2019). *Smartphone ownership is growing rapidly around the world, but not always equally*. Available at <https://www.pewresearch.org/global/2019/02/05/smartphone-ownership-is-growing-rapidly-around-the-world-but-not-always-equally/>

Contextual backgrounds of the development and deployment of technology: The Republic of Korea is one of the countries with the highest rate of mobile phone ownership, which creates a robust sub-market for limited versions of high-tech devices. Hyodo phones have been catered to the needs of older persons. They are affordable, simple to use and have special features for older persons. A sizable market enables mobile companies to develop Hyodo phones and maintain their supply chains.

Impacts: Older persons are one of the most vulnerable groups in terms of digital exclusion. As an adaptive technology for older persons in the digital age, Hyodo phones serve as special versions of existing mobile phones that older persons can easily access, afford and adopt.

Lessons learned: It is important that a variety of devices and services with different levels of functions are available in the market. Often, companies develop and provide devices and services with an assumption that the default customer is a young and well-educated person. However, the needs of different groups in society are diverse and low-tech devices with special features should also be available in addition to high-tech devices.

Opportunities and challenges for scale-up: Each country has a different environment in terms of mobile communication services. It is important that companies recognize older persons as significant customers and develop appropriate business models to deliver adaptive technology that meets their needs.

B. Advancing Health and Well-being into Old Age

The second priority direction of the MIPAA is advancing health and well-being into old age. It covers six key

issues (Table 2.3). **The core principle is that older persons are fully entitled to have access to health care and services, including health promotion, disease prevention, rehabilitation and sexual health care.** While the



Table 2.3 Key issues under priority direction II of the MIPAA

Issue II-1: Health promotion and well-being throughout life
Issue II-2: Universal and equal access to health-care services
Issue II-3: Older persons and HIV/AIDS
Issue II-4: Training of care providers and health professionals
Issue II-5: Mental health needs of older persons
Issue II-6: Older persons and disabilities

Source United Nations (2002). *Political Declaration and Madrid International Plan of Action on Ageing*. Available at <https://www.un.org/esa/socdev/documents/ageing/MIPAA/political-declaration-en.pdf>

incidence of chronic and degenerative disease rises sharply with age, older persons are among the most vulnerable groups of emerging and re-emerging communicable diseases. The COVID-19 pandemic reminds us of the significance of protecting older persons against infectious diseases, in addition to the threat of non-communicable diseases. It is important to note that health is not merely the absence of disease and infirmity, but is a state of complete physical, mental and social well-being.

The following examples illustrate how technology could advance health and well-being into old age based on the experiences of China, Japan and the Republic of Korea. For good practices in Asia and the Pacific, ESCAP's publication "Using Information Communication Technologies to Address the Health Care Needs of Older Persons Managing Chronic Disease: A Guidebook and Best Practices from Asia and the Pacific" provides useful references on the application of ICTs to promote accessibility of health and long-term care for older persons.

Case Study 4: Zhoujiadu Street AI Service Center for Older Persons (China)

Organization: Shanghai Pudong New Area Zhoujiadu Street Community Comprehensive Service Center for Older Persons

Date: 2019 – present

Problem statement: Zhoujiadu Street has many old residential communities with outdated infrastructures and a large number of old residents and people with special needs. For a long time, the community has been faced with challenges such as inactive service operation and limited resources.

Brief description: This is the first comprehensive community based old-age care institution in Shanghai Pudong New Area with integrated functions of 24-hour short- and medium-term residence and care, day care, home-based service, nursing station and family assistance. The institution effectively handles requests from older persons and supervises the services through an intelligent management system. The administrator can oversee the service status based on system data, establish personal health archives of older people, formulate and update the daily care plan and share the latest information with the older persons' families.

How does it work: Zhoujiadu Street Community Comprehensive Service Center for Older Persons provides conventional daytime care, long-term care, recreational and service activities. The service center builds AI

service stations for older persons to improve the quality of life of older persons. For example, in the "Minutes Clinic", smart self-service physical examination robots help older persons with physical examination around the clock. They could quickly collect and analyze data and issue physical examination reports within a few minutes. In addition, "UFU robot" is designed to serve older persons with lower limb disabilities. It helps them not only stand but also walk around as they wish. The service center also provides a robot rental service for older persons living in the area to help them navigate their movements at home.

The service center helps solve problems with home-based care by providing various options making use of advanced technology. One of its assets is China's first old-age care service robot with a flexible robotic arm that provides intelligent assistance service for old-age care. A smart old-age care data center has also been set up. Through resource aggregation and AI technology, a comprehensive old-age care service ecosystem is formed, in which older persons could enjoy various resources.

Figure 2.4 Smart old-age care data center



Source Sohu (2019). (https://www.sohu.com/a/336660834_313745)

Contextual backgrounds of the development and deployment of technology: In recent years, the Chinese Government has continuously issued policies and specifications to boost the development of aged care industry. Above all, development of AI and the widespread application of "Internet+" have made comprehensive intelligent old-age care service a reality.

The telemedicine consultation platform connects telemedicine centers of hospitals and provides detailed report interpretation and consultation services. 32 door-to-door miniature old-age care service stations

collect relevant data into the data center in real time and establish dynamic health archives for each old resident.

Impacts: The development of AI for old-age care enhances service quality. Old-age care robots are also widely applied to reduce risks in old-age care service and human costs. In particular, during the COVID-19 pandemic, the day care center has timely adjusted its service model by moving activities online. Technology has given impetus to voluntary services and delivered loving care. The community old-age care demand network has been established for purposeful delivery of voluntary services. Cloud information has been made available to expand service radius. With the help of Dingtalk.com, street communities have improved service response speed and quality. This helps eliminate the blind spots of old-age care and meet the growing, changing demands of older persons.

Lessons learned: The success of the service center can be attributed to its high practicability and adaptability to the evolving demands of older people. The scope of services has been extended from groups in special needs to comprehensive aged care services. Further improvements can be expected as technology advances.

Opportunities and challenges for scale-up: In the future, with widespread application of 5G, AI will be brought into full play to serve older persons. A smart aged care ecosystem that features real-time monitoring, intelligent early warning and quick responses will be in place. However, further and future success depends on whether Internet of Things, big data and intelligent technology are developed to their fullest potential.

Reference: <http://ylgw.shweilao.cn/cms/cmsDetail?uuid=b5c7245f-29c9-4b41-8931-f4bbbf791538>

Case Study 5: Telemedicine-based medical and daily care service (China)

Organization: Beijing Blue Satellite Communication Technology Co., Ltd.

Date: 2016 – present

Problem statement: Medical care is a crucial part of old-age care services. Given the large population of older persons, China's medical care lags behind and suffers from regional development imbalance. How to provide older persons with timely, effective and convenient medical care services has become an important issue.

Brief description: This is a telemedicine solution with integrated old-age medical and daily care. It provides telemedicine and health management solutions for communities and old-age care institutions. It makes use of the Military Telemedicine Information Network—China’s largest telemedicine network platform built and operated by the Beijing Blue Satellite Communication Technology Co., Ltd. (“BBSCT”), as well as the resources of more than 1,500 second-class or above hospitals and over 300 grade A third-class hospitals on the platform.

How does it work: By integrating military and local telemedicine resources, BBSCT constructs a nationwide telemedicine service platform and performs functions such as remote consultation, remote outpatient service, specialized diagnosis, remote monitoring, health management, surgical demonstration and teaching. Through the integration of high-quality medical resources, it helps users solve a full spectrum of health cycle problems from health, sub-health, disease diagnosis, treatment to rehabilitation.

Figure 2.5 BBSCT’s self-service health management system



Source BBSCT (<http://www.chinabsc.com/index.aspx>)

Contextual backgrounds of the development and deployment of technology: It is important to develop a telemedicine service platform available in multiple network environments that integrates the Internet, dedicated access line and satellite. Firstly, a cloud service platform is built to provide data storage, data management, information exchange and other support for various telemedicine applications. Secondly, a multi-network integration platform is built to support different network access methods, such as dedicated ground line, Internet, satellite network and 2G/3G network, to connect telemedicine systems in various provinces and cities and to provide an Internet interface to hospitals. Thirdly, a remote consultation system

centering around remote image diagnosis is built for consultation process management, image analysis, interactive guidance and other functions. Lastly, a health service system based on health records with electrocardiogram monitoring as the core is built to facilitate remote monitoring functions.

Impacts: The telemedicine system leverages medical expertise of large and medium-sized expert hospitals to provide effective and high quality medical care services, as well as facilitate academic exchange, medical observation and teaching. Members of the public in counties, townships and communities have better access to medical services, avoiding long-distance travel and saving related expenses.

BBSCT has made successful attempts in the telemedicine project and recorded remarkable achievements in many places. For instance, the Anhui Province Telemedicine Project includes one expert hospital and five county-level hospitals. It makes possible remote consultation, digital resource sharing, two-way referral, etc. Meanwhile, the Shaanxi Province Xianyang Telemedicine and Resident Health Record System is built as the operation and management center as well as the processing and storage center among hospitals with access to the network, thereby enabling information sharing and different kinds of telemedicine services.

During the COVID-19 pandemic, BBSCT, as a cooperative unit of the “National Telemedicine and Internet Medical Center”, has helped provincial and municipal telemedicine systems to access the national telemedicine platform. Through remote consultation with national experts, the center has facilitated medical decisions made for COVID-19 patients nationwide and provided targeted treatment.

Lessons learned: BBSCT has developed the system based on its experiences in telemedicine construction and operation of more than a decade and medical service resources. Operating through a nationwide telemedicine service platform, the model has integrated daily health management and remote consultation and connected community- and township-level health centers, providing targeted services to families, communities and old-age care institutions.

Opportunities and challenges for scale-up: Based on telecommunication technology, telemedicine provides a new operation model which would effectively improve China’s medical services, reduce medical expenditure and meet the diversified demands for medical care and old-age care. The biggest technical challenge lies with effectiveness of remote consultation and treatment in the local context.

Reference: <http://www.chinabsc.com/index.aspx>

Case Study 6: Xikang cloud-based health monitoring and management system (China)

Organization: Neusoft Xikang Healthcare Technology Co., Ltd.

Date: 2011 – present

Problem statement: Older persons have high incidence of disability and chronic diseases, with great demand for high-quality, accessible and affordable health care services, especially on constant health monitoring and management.

Brief description: This solution makes use of cloud service platform to build an effective health monitoring and management system for older persons, thereby promoting healthy and active ageing.

How does it work: "Online to offline" and "cloud + terminal" medical coordination are used to build a health management ecosystem for older persons.

The company has set up "health rooms" in old-age care institutions, communities and other dedicated areas and placed various health testing equipment in them, to provide comprehensive health management service for older people. An "I Keeper" all-in-one equipment is used for data collection and processing. This facilitates daily monitoring, chronic disease management and physical examination to achieve real-time health data management. In addition, Xikang Old-Age Care Watch helps connect family members and doctors. It is linked to Xikang's cloud platform and can receive messages concerning food, exercise, medication and so on from the cloud platform or the family care APP. Health management teams could then formulate professional chronic disease management plans based on such data, including professional prescription and medication reminders, diet and exercise schemes and one-to-one health guidance.

Figure 2.6 Xikang's all-in-one health terminal



Source Neusoft Xikang Healthcare Technology Co., Ltd.

Contextual backgrounds of the development and deployment of technology: As China's leading IT solution and service provider, the company applies Internet of Things and smart terminal technology to continuously and in real time, monitor the health of older people, upload their health data to cloud service platforms and customize personalized services by using big data processing technology.

Impacts: Conventional old-age daily care and medical care are mostly provided offline. This system shares health care resources and makes sure that people in need of these resources have access to them online. Moreover, the company has signed cooperation agreements on building urban cloud hospitals and healthy cities with many cities (e.g., China's first cloud hospital "Ningbo Cloud Hospital") and acted to promote the cloud hospital service plan in more than 30 cities, covering health management, public health and collaborative medical platforms. It has cooperated with more than 10,000 medical service institutions, covering more than 30 million people.

To improve COVID-19 pandemic prevention and control as well as satisfy people's diversified demands for medical care and health care, Shenyang Hunnan District Health Bureau in Liaoning Province, together with Zhongyi Northeast International Hospital, district central hospital and district hospitals, joined Xikangyun Cloud Hospital Platform on 3 February 2020. The purpose is to provide online medical consultation service, online diagnosis and treatment and other services for patients with chronic diseases.

Lessons learned: The multilevel old-age health care management system and the integrated resources on one hand meet diversified demands of older persons and on the other hand promote development of the old-age health care technology industry. This is conducive not only to improving current health care services, but also to relieving the problems caused by an ageing population and the associated rise of chronic diseases in China.

Opportunities and challenges for scale-up: How to pool the platforms and share medical resources of different partners to build and operate cloud hospitals is a challenge.¹⁴ New-generation information technology, which is being rapidly developed, could be used to promote integration of medical care resources, improve health management for older people and improve old-age care service.

Reference: <https://www.xikang.com/>

14 A cloud hospital is a platform that provides online medical treatment and health management services.

Case Study 7: AnshinNet, an AI health management system (Japan)

Organization: Fuyo Kaihatsu Company

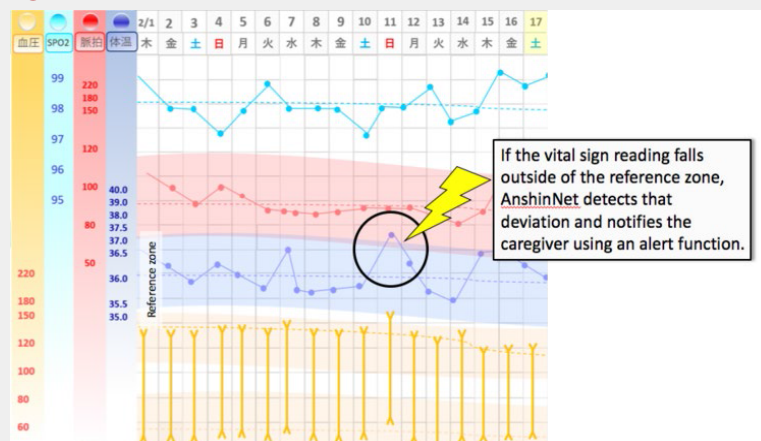
Date: 2012 – present

Problem statement: In 2008, when Shunsuke Maeda of the Fuyo group was visiting a hospital, he noticed that nurses working with older patients were paying more attention than usual to recording vitals. This is because conditions like dementia can create barriers to understanding a patient’s health status through a traditional medical interview.

Brief description: AnshinNet is an ICT tool that compiles health data from older patients and uses AI to assist caregivers in quickly detecting any health irregularities.

How does it work: AnshinNet uses a tailor-made alert system to notify caregivers in long-term care facilities when patients experience any health abnormalities. In facilities using AnshinNet, caregivers take the vitals of each patient (e.g., body temperature, blood pressure, pulse, respiratory rate, SpO2, level of consciousness) and by touching the devices (e.g., thermometer) to a digital reader, they can automatically input the data into the AnshinNet system. Caregivers can also record the type of care conducted using a tablet device, creating a clear and sharable record.

Figure 2.7 AnshinNet interface



Source Fuyo Kaihatsu Company. (<http://www.anshinnet.net/>)

The AnshinNet system then uses AI to compare the data with standard values and reference zones. If a vital sign reading falls outside of the reference zone, the system will detect the deviation and notify the caregiver and nursing staff using an alert function. In addition to detecting health irregularities, AnshinNet uses a system to score the health status of patients. This system allows caregivers to have a better overall picture of the patients' health status.

Finally, AnshinNet allows for easy sharing of patients' health data with doctors at nearby hospitals. This means that doctors can make informed decisions about whether a patient might need to be hospitalized due to changes in their health status.

Contextual backgrounds of the development and deployment of technology: The reference range for vital statistics in older adults often differs from that of the general adult population. For example, older people may have lower temperature and pulse rate because of aging. AnshinNet is designed to account for these differences, allowing for faster discovery of health abnormalities.

AnshinNet requires a PC to operate the system, an iPad (1 for every 20 people), as well as equipment to measure blood pressure, body temperature and blood oxygen.

"AnshinNet One" has been launched, which uses a smartphone app and does not require any additional infrastructure investment.

Impacts: AnshinNet significantly reduces the workload of caregivers in terms of recording and analyzing vital statistics. For example, in the test facility, the time caregivers spent recording vital statistics was halved after introducing AnshinNet.¹⁵ This eases the burden on caregivers and allows them focus on other aspects of their work.

The system also allows for better early detection of potentially life-threatening medical conditions, even when patients themselves are not reporting any symptoms. For example, in one facility, a woman in her 80s with a history of myocardial infarction had an alert appear, showing that her blood pressure and oxygen saturation had dropped below the standard range. When she was examined at the adjoining hospital, they discovered that she was in the early stages of cardiac failure. Because the issue was discovered in the early

15 Fuyo Kaihatsu Company (2020). *Record labour saving*. Available at <http://www.anshinnet.net/tokucho/saving.html>

stages, before it became critical, the woman only needed to be hospitalized for a few days before she could return to her normal life.

Technology such as AnshinNet has also been recognized during the COVID-19 pandemic. For example, the Japan Medical Association's taskforce on the COVID-19 response recognized the role of applications such as AnshinNet in early detection of disease in their recommendations report for home and long-term care.¹⁶

Lessons learned: In clinics with care personnel who have low IT literacy, it is difficult to make the switch from paper records to AnshinNet. They have subsequently introduced training sessions to help address this issue.

When marketing the product, it was found that while people initially expressed interest in the product, it was difficult to convert this interest into sales. Now the product is being marketed in terms of its ability to reduce medical risk and standardize health management.

Opportunities and challenges for scale-up: The low infrastructure requirements and ease of use make the product appealing for a variety of facilities to adopt. However, given the difference between facilities such as hospitals, nursing homes and individual homes, further clinical studies are required to improve knowledge of how to operate in these diverse settings.

Reference: <http://www.anshinnet.net>

16 Japan Medical Association COVID-19 Experts' Meeting (2020). *Issues and solutions for COVID-19 in home medical care and long-term care, recommendations Task force report*. Available at <https://www.covid19-jma-medical-expert-meeting.jp/topic/2942>

Case Study 8: DFree, an ICT device for bladder function (Japan)

Organization: Triple W Japan K.K.

Date: 2017 – present

Problem statement: According to a survey conducted in Japan, around 80% of older persons suffer from some sort of urinary disorder. Incontinence has wide-ranging negative impacts on the quality of life as it may cause the person to hesitate to go on outings, decrease their willingness to engage with others and disrupt their sleep. It also undermines their sense of dignity and confidence.

It is common for bed-ridden older persons to rely on diapers. Also, the caregiver does not necessarily know the timing of when the person has urinated. Prolonged exposure to wet diapers can be unsanitary and can increase the risk of urinary tract infections, while constantly checking for incontinence is a large burden on the caregiver.

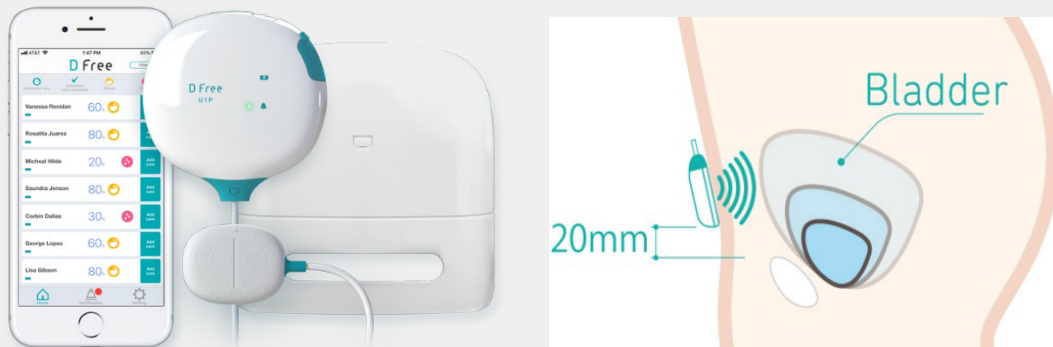
Brief description: DFree, which stands for “diaper free”, is a wearable device that detects the expansion of the bladder using ultrasonic waves. By monitoring and visualizing the bladder condition, it is able to signal the individual or a caregiver when urination is required.

How does it work: The DFree device is secured to the lower abdomen with medical tape. As urine accumulates in the bladder, the bladder expands. DFree uses ultrasound to measure the size of the bladder and indicate how full it is on a scale of 1 to 10.

The device, which is available for purchase or rental, is synced with a free app on the user’s phone or tablet. The device sends a notification when the urinary volume reaches a certain threshold, indicating that the person should go to the toilet. In addition, DFree provides a visual record of the individual’s urination pattern, which leads to greater awareness of his or her urination cycle.

A second version of the device, DFree Pro, is designed specifically for use by hospitals, nursing homes and in-home care agencies. Instead of pairing with the user’s personal device, DFree Pro pairs with a base station, recording and uploading the patient’s urination status to the cloud to enable remote monitoring. This allows caregivers to provide transfer and toileting assistance in a timely manner.

Figure 2.8 The DFree device and smartphone app



Source TripleW Japan K.K. (<https://www-biz.co/en/>)

The DFree dashboard shows the timing and frequency of multiple patients' urination at a glance and care providers can record the time and types of toilet care provided for each visit.

Contextual backgrounds of the development and deployment of technology: The product has a neat design and is non-invasive, making it easy for older persons and caregivers to use. It has been developed through ongoing trials and close interaction with care facilities.

Apart from the device, the service requires the user to download the app on a smartphone or tablet.

Impacts: DFree was first introduced in Japan and has since expanded to Belgium, France, Germany, Hong Kong, China, Singapore, the Republic of Korea and the United States. The product has been used in more than 500 elder care facilities.

Use of DFree can alleviate the need to rely on diapers, prevent embarrassing accidents and reduce the risk of falls that may occur when trying to rush to the toilet. Data gathered by the company showed a 46.8% decrease in incidences of incontinence among one sample group following the introduction of DFree and a 27.3% increase in the toileting rate among a second sample group. Regaining control of one's toileting helps a person maintain a sense of dignity and confidence that can potentially impact their social engagement and mental wellbeing. It is also found that DFree has a positive impact on caregivers' productivity, given a 22.5% decrease in manhours spent on toileting tasks.

In the context of the COVID-19 pandemic, as caregivers are seeking to minimize their close contact with those under their care, DFree helps handle toileting needs efficiently and with the optimal timing,

minimizing the need for multiple visits by caregivers.

Lessons learned: The key to success is the simple, non-invasive and wearable design that focuses on the timing of urination rather than the quantity of urine in the bladder, which was measured by medical devices in the past. This approach allows the company to target eldercare facilities and individuals as opposed to hospital settings.

Opportunities and challenges for scale-up: The company has expanded to Belgium, France, Germany, Hong Kong, China, Singapore, the Republic of Korea and the United States and it has the potential to expand worldwide. The company has continued to refine the product in terms of the precision and size of the device. The cost of the product, although lower than alternatives at this moment, may need to be lowered further in order to reach a broader market, particularly in developing countries. The company also intends to explore related markets leveraging similar wearable technologies.

Reference: <https://www-biz.co/en>

Case Study 9: The Iwaki Health Promotion Project (Japan)

Organization: Hirosaki University Center of Healthy Aging Innovation (Hirosaki COI)

Date: 2005 – present

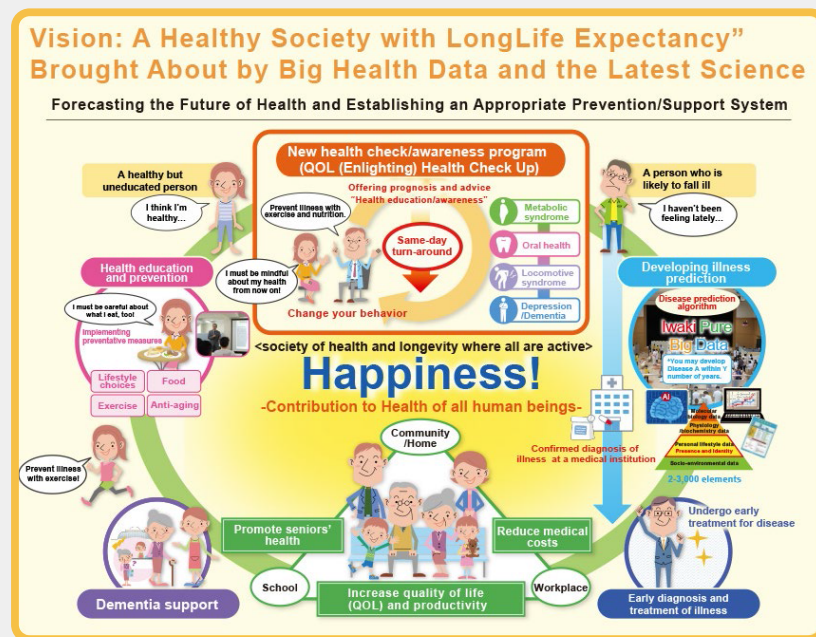
Problem statement: Aomori, where Hirosaki University is located, has been ranked in recent decades as the prefecture with the lowest life expectancy in Japan. Promoting the health and well-being of older persons while reducing health care costs is therefore a priority for Aomori.

Brief description: The Iwaki Health Promotion Project, which was initiated at Hirosaki University in 2005, is an innovative health promotion model based on big data. The project accumulates data from approximately 1,000 participants annually, covering 3,000 health-related items. It also brings together government, private sector, academia and industry to research and create practical applications for innovative ideas.

How does it work: The project initiated a health check and awareness program, the “Quality of Life (QOL) Health Check-up”, that offers holistic services of prevention, early diagnosis, illness prediction and dementia support. Through an analysis of over ten years of integrated big data comprised of over 3,000 health-related elements (e.g., physiology data, personal lifestyle data and socio-environmental data), Hirosaki COI has developed the means to detect early signs of dementia and lifestyle diseases and continues to propose and verify preventative measures, applying its achievements to society at large.

Unlike cohort studies¹⁷, in which there is a single outcome and the items to be measured are predetermined, this project allows a single data element to be cross-checked to evaluate its relationship with any of the other 3,000 data elements. Therefore, it is possible to collaborate with a wide variety of researchers and companies to establish predictive methods for various diseases such as diabetes and dementia.

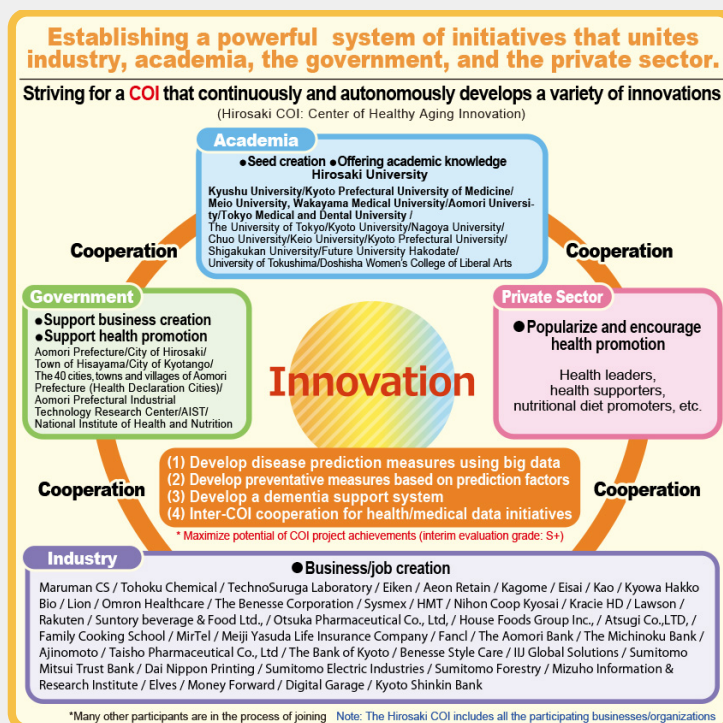
Figure 2.9 Vision of Hirosaki COI



Source Hirosaki COI (https://coi.hirosaki-u.ac.jp/en/?page_id=52)

17 Cohort studies are a type of longitudinal study which research a group of people who share a common characteristic (i.e., a cohort) over a period of time.

Figure 2.10 Multi-sectoral collaboration on innovation



Source Hirosaki COI (https://coi.hirosaki-u.ac.jp/en/?page_id=52)

Contextual backgrounds of the development and deployment of technology: The collection and sharing of a massive number of data items is the key to this project. Hirosaki COI created a system to facilitate the process and provided guidelines on how the data should be used, thereby enabling an open innovation platform.

One of the characteristics of Hirosaki COI is the collaboration between academia and the private sector. They also worked with the media to strategically advertise their findings to attract the public's attention.

Impacts: According to 2017 national data, Aomori Prefecture recorded the highest increase in average healthy life expectancy for men and the seventh highest increase for women in Japan.

It is estimated that this project, through its emphasis on public education, prevention, early detection and the commercialization of preventive measures, has had an economic impact of JPY 24.2 billion (USD 0.2 billion). In the long term, it is expected to decrease medical costs by JPY 52.7 billion (USD 0.5 billion),

generating a significant impact on health care reform.

The project was adopted as a Center of Innovation/Japan Science and Technology Agency Program in 2013 and was awarded the Prime Minister's Award, the highest rank of the Japan Open Innovation Prize, as the best project in 2019. Furthermore, the project was awarded the Innovation Net Award 2020, in the category of the MEXT (Ministry of Education, Culture, Sports and Science and Technology) Minister's Award.

Lessons learned: Hirosaki COI strives for a system that continuously and autonomously develops a variety of innovations through establishing a powerful network of initiatives that unites industry, academia, the government and the private sector. As of January 2020, Hirosaki COI collaborates with more than 14 large enterprises, including Kao Corporation and Lion Corporation. They established research programs jointly funded by private companies. Hirosaki COI raised JPY 400 million (USD 3.9 million) from the private sector, which helped build a strong and firm foundation of research and networking.

The multisectoral collaboration was made possible as various stakeholders, including the community, were united by the common objective of promoting the good health and well-being of citizens in the prefecture.

Opportunities and challenges for scale-up: The QOL Health Checkup was introduced to Vietnam, where a trial run was held in February 2019. It was then officially adopted by Japan International Cooperation Agency (JICA) as one of their international technology cooperation projects in the category of health care. This model will be expanded to other Asian countries to encourage innovative local health promotion through the use of big data.

Reference: <https://coi.hirosaki-u.ac.jp/en>

Case Study 10: Hyodol, an AI companion robot (Republic of Korea)

Organization: Studio Cross Culture Co., Ltd.

Date: 2014 – present

Problem statement: The family structure in the Republic of Korea has dramatically changed over the years. The number of multi-generational households has decreased, while the number of single-person households has increased. Specifically, the proportion of older persons living alone has steadily increased, almost reaching 20%, resulting in social problems such as social isolation, loneliness, depressive symptoms and increased risk for other health and mental health issues of older persons.

Brief description: Hyodol is an AI companion robot. Unlike other plastic-covered robots, Hyodol looks like a little child doll, which reminds older persons of their grandchildren, giving them a sense of companionship.

How does it work: Hyodol has five core functions, namely (i) daily reminders such as medication, schedules and alarm clocks, (ii) interactions through touching, (iii) safety check, (iv) dementia prevention program and (v) voice messages. Family members can interact with Hyodol remotely, by recording and sending voice messages to the robot. Also, a mobile application is available, which enables family members to keep updated with the users' activities.

Figure 2.11 Hyodol, an AI companion robot



Source Studio Cross Culture Co., Ltd. (<https://www.hyodol.com>)

The deployment of mobile devices for older persons often fails due to a lack of wireless internet service at their homes. Hyodol comes with LTE (i.e., wireless broadband communication) so that users do not need to set up and pay for wireless internet service to use the robot.

Hyodol costs around KRW 800,000 (around USD 730). Also, a rental option is available at the price of KRW 25,900 per month (around USD 24) with the requirement of at least 39 months of rental period.

Contextual backgrounds of the development and deployment of technology: A significant driving force behind the rapid deployment of Hyodol over the past two years was local governments' support through purchasing and providing Hyodol to older persons living alone and under or near poverty in their communities.

Impacts: As of January 2021, approximately 2,300 Hyodols have been adopted by older persons in the Republic of Korea. A pilot study reported that using Hyodol for 11 months contributed to reducing depressive symptoms among 42 older users.¹⁸

While companion robots could encourage older persons to actively participate in daily activities, improve their well-being and offer essential supports in case of emergency, further research is needed to evaluate the impacts of Hyodol on the multiple domains of quality of life of older users and their caregivers.

Lessons learned: Many mobile devices for older persons have failed due to poor design and/or a lack of infrastructure to use them such as wireless internet service. One of the primary reasons for the success of Hyodol's deployment is that it comes with wireless broadband communication. It is important that when a mobile device is developed, it should come "all in one package".

Affordability is another important factor for success. Most of the AI companion robots for older persons available on the market are expensive. Hyodol is in the price range that individuals can afford, also with several buying and renting options.

Opportunities and challenges for scale-up: For the sustainability of new products and services, maintenance is as important as development and deployment. Currently, approximately 2,300 older persons are using Hyodol and more are expected for the coming years. Effective customer support for the growing number of users will be a significant challenge for the company.

In view of the COVID-19 pandemic, remote and uncontact¹⁸ caregiving has become more important. It serves as an opportunity to expand the market of this AI companion robot. Indeed, many local governments have initiated remote caregiving programmes using Hyodol as a part of their social services.

Reference: <https://hyodol.com>

18 Source Jo, H.S., Kim, J.H. and Kim, S. (2019). *Factors related to the effectiveness in the use of an ICT-based toy robot for the in-home care of community dwelling elderly*. Korean Journal of Health Education and Promotion, 36(5), 43-51.

19 A combination of the prefix 'un' and the word 'contact' which means contactless or non-face-to-face.

C. Ensuring Enabling and Supportive Environments

The third priority direction of the MIPAA is ensuring enabling and supportive environments for older persons. It covers four key issues (Table 2.4). **The core principle is to create inclusive and cohesive societies**



for all. Older persons are entitled to live in environments that enhance their capabilities. It includes the idea of ageing in place with access to basic

services such as clean water and adequate food, but more importantly, age-friendly environments (e.g., housing design, public spaces, transportation and other infrastructure) that enable older persons to stay active and socially connected. **The case studies below show how technology could be leveraged to ensure enabling and supportive environments for older persons, especially during times of crisis and emergency.**

Table 2.4 Key issues under priority direction III of the MIPAA

Issue III-1 Housing and the living environment
Issue III-2 Care and support for caregivers
Issue III-3 Neglect, abuse and violence
Issue III-4 Images of ageing

Source United Nations (2002). *Political Declaration and Madrid International Plan of Action on Ageing*. Available at <https://www.un.org/esa/>

Case Study 11: Weihai Virtual Nursing Home (China)

Organization: 12349 Weihai Home Service Call Center

Date: 2012 – present

Problem statement: Among those living in Weihai City, Shandong Province, 750,000 are over 60 years old, accounting for 29% of the city's population. There is a pressing need for home-based aged-care services. A survey run by local departments interviewed 620,000 older persons and indicated that 96% of the respondents favored community and home-based aged-care services over institutional services.

Brief description: Established in August 2012, 12349 Weihai Home Service Call Center has developed a "virtual nursing home" which integrates call service, cultural and educational services, aged care consultation, voluntary service, project incubation and product and achievement display. With services

covering the whole Weihai City, it is the first service center that covers both urban and rural areas and benefits all its residents.

How does it work: Weihai City adopted the framework of "two halls, seven centers and four workstations" to integrate more than 3,000 units of aged-care institutions, medical and health institutions, service providers, etc. to build the 12349 Weihai Home Service Call Center. The Center effectively combines the concept of "Internet+" with the community and home-based aged-care service system to provide a "nursing home without walls" for older people.

The "two halls" refer to the exhibition halls that showcase aged-care products and the achievements of aged-care services. The "seven centers" include 12349 Weihai Home Service Call Center, Points-based Elderly-Care Service Center, Quality Management Center, Elderly-Care Consultation Center, Project Incubation Center, Cultural and Educational Service Center and Volunteer Service Center. Meanwhile, the "four workstations" are located in Rushan, Wendeng, Rongcheng and Shidao to collect and analyze information of residents in their respective regions and coordinate the provision of different aged-care services.

Figure 2.12 Website of the Weihai "12349" Call Center of Home Services



Source 12349 Weihai Home Service Call Center. (<http://www.weihai12349.cn/>)

Contextual backgrounds of the development and deployment of technology: The service requires only one telephone call to contact the service center, which is convenient for the older persons. In addition, Weihai Municipal Government has taken the lead to distribute 12349 telephones free of charge to household who meet the subsidy conditions, together with a monthly rental subsidy of RMB 10 (USD 1.6).

Impacts: The slogan "Once you call at 12349, everything will be done" is deeply rooted in the hearts of the residents of Weihai. As of the end of 2018, the platform had more than 800,000 registered residents, 665,000 of those over 60 years old and more than 3,200 affiliated enterprises across the city. Calls totaled at more than 3 million.

The convenient call service center enables older persons to enjoy professional aged-care services at home. It has proved to greatly improve their quality of life, reduce the burden of their children and promote innovation and development of the aged-care industry.

During the COVID-19 pandemic, the Center has answered a large number of COVID-19 related enquiries every day. Members of staff also made full use of accessible services and took the initiative to reach out, especially for the groups who are entitled to government purchased services, older persons living alone and other vulnerable groups, so as to help with pandemic prevention and control. This has effectively raised older persons' awareness of the importance of pandemic control and encouraged them to take effective measures to reduce the risk of infection.

Lessons learned: The success of this service can be attributed to its convenience and comprehensiveness. At the same time, project incubation and product and achievement exhibitions effectively promote the development of the aged care industry.

Opportunities and challenges for scale-up: To meet the increasing needs of family-based aged care services, many cities are building virtual nursing homes, suggesting large potential for platforms such as 12349 Weihai Home Service Call Center. To replicate the success in other regions, it is necessary to effectively integrate the existing platforms, channels and resources to provide easily accessible and comprehensive services.

Reference: <http://www.weihai12349.cn/>

Case Study 12: Personal Emergency Link Service (Hong Kong, China)

Organization: Senior Citizen Home Safety Association (SCHSA)

Date: 1996 – present

Problem statement: In 1996, when a cold snap hit Hong Kong, more than 150 older persons who lived

alone died. This highlighted the challenges of ageing in place as older persons may not have access to vital care and support services, especially when in an emergency.

Brief description: The Personal Emergency Link Service is a comprehensive 24-hour call and care service for older persons.

How does it work: Older persons can access the service by subscribing to the monthly plan offered by SCHSA (approximately USD 16 as of May 2020)²⁰. Once subscribed, care workers will install a fixed host device at the user's residence. A water-resistant remote control will also be provided so users can carry it around their residence. Both the fixed host device and the remote control have a button that directly connects to a 24-hour service hotline when clicked.

Other than providing emergency assistance, the hotline also offers support and care service, community service, referral service, caring and appointment reminder service and emotional counseling service. The hotline is operated by trained volunteers, while professionals such as nurses and social workers would provide the necessary support if needed.

Over the years, in response to technological advancements, SCHSA has offered additional plans for users to access the service through a specialized phone or a mobile application on a smartphone. Both options mark a significant breakthrough by expanding their service reach beyond the home environment. Furthermore, leveraging on Global Positioning System (GPS), older persons can be tracked down when they require emergency assistance outdoors.

Figure 2.13 Specialized phone and mobile application on a smartphone



Source SCHSA. (<https://www.schsa.org.hk/en/home/index.html>)

20 Senior Citizen Home Safety Association (2019). *Care-on-Call Service*. Available at https://www.schsa.org.hk/en/assistant_and_support/service_introduction/index.html

Contextual backgrounds of the development and deployment of technology: The simplistic and non-invasive design of the service has been catered to the needs of older persons. Besides, the development of the service has been largely in response to the feedback from them.

A prerequisite of the service requires users to have access to a fixed telephone connection in their residence or a smartphone.

The HKSAR Government offers subsidies to economically disadvantaged older persons that wish to subscribe to the service.

Impacts: As of April 2020, the Personal Emergency Link Service was accessed over 10 million times, with more than 600,000 cases where older persons were sent to the Accident and Emergency Department through the service. The SCHSA has also made over 8.7 million calls to reach out to those subscribed to their service.²¹ To give some context, the average number of Hong Kong's population over the age of 65 is around 900,000 over the past 25 years.²²

Over the years, the Personal Emergency Link Service has become a household name in Hong Kong. The service is popular amongst older persons due to its simplicity, which does not require much or any digital skills and is friendly to persons with disability.

In response to the COVID-19 pandemic, the service has launched a special program to provide personal protective equipment and medications to older persons. As they may feel an increased sense of loneliness during a lockdown, the program also ramped up mental health services. In just two months since its launch, the program has benefitted 20,000 older persons.²³

Lessons learned: The success of the service largely stems from its simplicity and its ability to adapt to meet the ever-changing needs of the ageing populations. While approximately 90% of the calls are of a non-emergency nature, SCHSA has expanded its service from primarily focusing on emergency assistance to providing more holistic and integrated care services. Furthermore, the service is able to innovate in response to the latest technological trends.

21 Senior Citizen Home Safety Association (2019). *Service Statistics*. Available at https://www.schsa.org.hk/en/introduction/media/service_data/index.html

22 Census and Statistics Department (2020). *Population Estimates*. Available at <https://www.censtatd.gov.hk/hkstat/sub/sp150.jsp?tableID=02&ID=0&productType=8>

23 Sky Post (2020). 平安鐘抗疫行動 接觸逾2萬長者供緊急支援. Available at <https://skypost.lifestyle.com.hk/article/2628077/%E3%80%90%E4%BA%BA%E9%96%93%E6%9C%89%E6%84%9B%E3%80%91%E5%B9%B3%E5%AE%89%E9%90%98%E6%8A%97%E7%96%AB%E8%A1%8C%E5%8B%95%20%E6%8E%A5%E8%A7%B8%E9%80%BE2%E8%90%AC%E9%95%B7%E8%80%85%E4%BE%9B%E7%B7%8A%E6%80%A5%E6%94%AF%E6%8F%B4>

Opportunities and challenges for scale-up: Given the simplicity and effectiveness of the Personal Emergency Link Service, there are ample opportunities for scale-up in other cities. In fact, SCHSA has provided consultancy services to Singapore and some cities in China, including Macau SAR and Shanghai.²⁴ The primary challenge is to identify a trustworthy service provider that is able to provide services tailored to local needs.

Reference: <https://www.schsa.org.hk/en/home/index.html>

Case Study 13: LASHIC, a community-based elderly support project utilizing IoT (Japan)

Organization: INFIC Inc.

Date: 2002 – present

Problem statement: Solitary death is a rising problem in Japan's aged society. Many older people are concerned about living at home alone, where they might face the prospect of dying alone and of their death remaining undiscovered for days or weeks. To allow older people to feel more secure about living independently, INFIC developed an in-house sensor system that monitors their activity and room condition, enabling them to feel safe even when living alone.

Brief description: LASHIC uses a system of IoT sensors to monitor the daily activities and living environment of older people who are living alone. When the system detects any abnormalities, it sends an alert to family members or the nearby landlord, so that they can check in on the older person. LASHIC devices are available for older people living at home, as well as for care facilities.

How does it work: There are currently three LASHIC devices. LASHIC-room is a sensor that detects room temperature, humidity, light levels and the older person's activity. An AI system analyzes this data to provide information on the risk of heat stroke and mild cognitive impairment (MCI), encouraging a self-reliant lifestyle.

24 Senior Citizen Home Safety Association (2019). *2016-17 Annual Report*. Available at https://www.schsa.org.hk/filemanager/common/SCHSA_Annual%20Report%202016-17_full%20ver_DP.pdf

Figure 2.14 Types of LASHIC devices (call, sleep, room)



Source INFIC Inc. (<https://infic-g.net>)

Based on feedback received from care facilities, INFIC developed LASHIC-sleep, a bed sensor system that detects pulse rate and body movement during sleep and provides alerts about any irregularities.

Finally, LASHIC-call is a nurse-call system that enables users to call their family members or a nearby landlord (whoever is registered in the system) with just a single button. All LASHIC devices are non-invasive so they do not exert additional stress on older persons' lifestyles.

Contextual backgrounds of the development and deployment of technology: This innovation is focused on pushing forward scientific long-term care services, a goal of the data health revolution being undertaken by the Ministry of Health, Labour and Welfare.

Users have to install the device, the initial investment cost for which is USD 200-300 depending on the model (LASHIC room/sleep/call). The operating cost is approximately USD 10/month.

The device requires an internet connection to function. However, customers who do not have Wi-Fi at home can purchase a communication device as part of the service at a slightly increased cost.

Impacts: The data collected by the LASHIC system has been used in a variety of ways to improve care for older persons. By applying machine learning to the data accumulated by LASHIC, the system is able to provide alerts for over 20 conditions, including heat stroke, MCI and others. Moreover, by analyzing the accumulated data together with caregivers' records from care facilities, INFIC successfully identified that

urinary tract infections were responsible for the majority of older persons' hospitalizations. Currently, they are also working on an algorithm system to prevent falls in care facilities.

Care facilities using LASHIC have seen impacts in terms of both reduced costs and decreased burdens on caregivers. For example, at an Intensive Care Home for the Elderly (*tokuyou*) with 104 beds, the system achieved a cost reduction of JPY 1,300,000 (USD 12,500) per month, an efficiency improvement of 5%. Furthermore, falling incidents were reduced by 34%.

In terms of decreasing the burden on caregivers, some facilities using the system found that night patrols became unnecessary after introducing LASHIC-room and LASHIC-sleep. The alert system offers guidance to care staff, providing a sense of security for less experienced staff. By reducing these care burdens, LASHIC could contribute to alleviating the care workforce shortage in Japan.

Lessons learned: INFIC uses the concept that their systems should support both older people and their caregivers.

The fusion of care and IoT/AI may not be new, but it is important for the technology system to be created by people who understand the needs of older people and their caregivers. As such, at INFIC, the system engineers who handle the IT component participate in long-term care training modules and communicate frequently with the actual caregivers. This has ensured that systems engineers create solutions that directly correspond to the needs of caregivers.

Users of monitoring devices similar to LASHIC are sometimes concerned that the device might violate their privacy. LASHIC sensors do not use a camera and instead rely on other metrics so that users can preserve their own privacy.

Opportunities and challenges for scale-up: While there are many devices that monitor the daily activities of older people, the IoT solution LASHIC provides by triggering alerts based on accumulated data is unique in this industry.

At the national level, they collaborate with NTT East Japan, one of Japan's largest telecommunications providers, in implementing in-home services. LASHIC was selected as one of the collaborators under the program "NTT East Accelerator Program LightnIC", which aims to accelerate infrastructure-building through innovation.

Internationally, INFIC expanded its network to the Philippines by opening a new care facility in Manila where their devices are installed as part of a project in cooperation with the Japan International Cooperation Agency (JICA). Furthermore, they have received offers from China and the United States to deploy the system in those countries as well.

Reference: <https://infic-g.net>

Case Study 14: Emergency Safety and Security Service (Republic of Korea)

Organization: Ministry of Health and Welfare

Date: 2008 – present

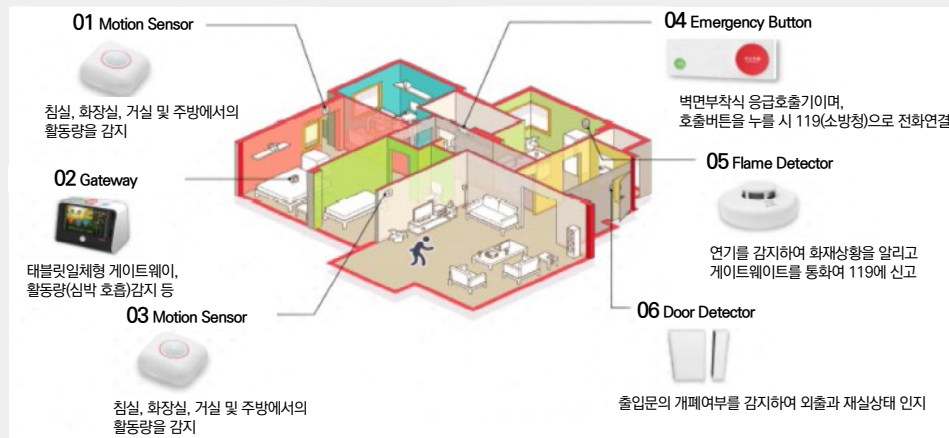
Problem statement: The number of older persons living alone has been increasing and currently about one out of five older persons in the Republic of Korea live alone. Living alone in later life increases the vulnerability to delayed response to fall injuries as well as the risk of lonely death.

Brief description: The Emergency Safety and Security Service detects emergency situations in the houses of older persons living alone and people with disabilities using multiple sensors and report them to emergency management personnel and one of the 119 rescue centers that operate 24/7.

How does it work: Older persons living alone and “under/near poverty” as well as people with disabilities who spend most of their time alone are eligible for the service.

The Ministry of Health and Welfare oversees the program and provides funding and guidance to local governments, while local governments select service providers, run trainings for emergency management personnel and establish a network collaborating with key stakeholders such as fire department, local community welfare center and the Social Security Intelligence Service. Frontline service providers are local community welfare centers, wherein emergency management personnel are hired and manage the system. The Social Security Intelligence Service is in charge of managing the data from the system.

Figure 2.15 New system with advanced gateways



Source Ministry of Health and Welfare of Republic of Korea.

The system includes gateway, motion sensor, flame detector, gas sensor and necklace-style emergency button typically known as a life alert necklace. The gateway is designed as an old-fashioned telephone with a few large buttons, thus users can simply press the buttons and make a call to a dedicated life care manager, emergency management personnel, or one of the 119 rescue centers, depending on the situations.

Contextual backgrounds of the development and deployment of technology: The program has been developed based on the Welfare of Senior Citizens Act, Article 27-2 Support for Senior Citizens Living Alone and the Act on Welfare of Persons with Disabilities, Article 24 Safety Countermeasures.

The program aims to reduce the vulnerability of older persons living alone and people with disabilities to delayed response to emergency situations and it is provided based on eligibility criteria such as financial status, living arrangement, severity of disability, etc.

Emergency management personnel play an important role in the deployment of the system. They visit users' homes, install the system and check regularly whether it works well.

Impacts: One of the significant achievements of the system was that service users were rescued in emergency situations of fire and gas leakage by early detection and swift response. Also, older persons living alone, people with disabilities and their family members could feel secure and less worried about emergency.

Based on the report from the Social Security Intelligence Service, a total of approximately 6,000 emergency cases were reported and dealt with by the 119 centers in 2017. About three quarters (73%) of the emergency cases were related to health issues such as fall injuries, while 25% were fire incidents and 1% were gas leakage incidents. By August 2020, around 100,000 older persons living alone and people with disabilities have received this service.

A brief released by the Social Security Intelligence Service reported that this program has saved around KRW 360 billion for the past ten years and the benefit/costs ratio was estimated as 3.7.

Lessons learned: One of the key success factors is to have well-trained emergency management personnel behind the computer-based monitoring system.

It is important to discuss and decide which government agency (e.g., central vs. local) takes the responsibility related to development, management and evaluation of the program at the beginning of planning to ensure effective collaboration among key stakeholders throughout the development and implementation process.

Opportunities and challenges for scale-up: Due to the COVID-19 pandemic, the importance of uncontact social services has increased. The ROK Government has decided to expand this service to cover an additional 100,000 older persons living alone and people with disabilities every year from 2021 to 2023. Also, the government plans to change existing devices with new advanced gateways (e.g., tablet-computers) in the homes of current service users. Countries experiencing rapid population aging and increase in older persons living alone could consider this program.

Reference: <http://www.bokjiro.go.kr/wellInfo/retrieveGvmtWellInfo.do?wellInfSno=242>



Chapter II. Utilizing Technology to Accelerate the Implementation of the MIPAA

Leveraging Technology for the Madrid International Plan of Action on Ageing; Experiences of China, Japan and the Republic of Korea

CREATING ENABLING POLICY FRAMEWORKS FOR GERONTECHNOLOGY

KEY STAGES OF THE TECHNOLOGY FOR ACTIVE AGEING ECOSYSTEM


1. PREREQUISITE



-AWARENESS
-ACCESSIBILITY

- 1 GERONTECH EXPO (CHINA)
- 2 PILOT DEMONSTRATION ZONES (CHINA)
- 3 MASTER PLANS FOR CLOSING THE DIGITAL DIVIDE (ROK)
- 4 UNIVERSAL DESIGN (JAPAN)

2. RESEARCH



-FUNDING
-CAPACITY BUILDING

- 5 REHABILITATION R&D SUPPORT PROGRAM (ROK)
- 6 GERONTECH YOUTH CHALLENGE (CHINA)

3. PRODUCT DEVELOPMENT



-TESTBEDS
-SCALING
-DATA

- 7 TRANSLATION RESEARCH PROGRAM & BUSINESS SUPPORT PROGRAM (ROK)
- 8 DEVELOPMENT AND STANDARDIZATION OF ROBOTIC DEVICES FOR NURSING CARE (JAPAN)
- 9 NEXT GENERATION MEDICAL INFRASTRUCTURE ACT (JAPAN)

4. ADOPTION



-MARKET ENTRY
-USER ADOPTON

- 10 INNOVATION AND TECHNOLOGY FUND (CHINA)
- 11 SUBSIDIES TO TECHNOLOGY COMPANIES AND USERS (CHINA)
- 12 WELFARE EQUIPMENT RENTAL PROGRAM (JAPAN)
- 13 COMMUNITY CARE PROGRAM (ROK)
- 14 "INTERNET+ELDERLY CARE" SERVICE PLATFORM (CHINA)
- 15 SMILE CARE FOOD (JAPAN)

CASE STUDY

Chapter III.

Creating Enabling Policy Frameworks for Gerontechnology

Following the case studies that illustrate the important role of STI in accelerating the implementation of the MIPAA, this Chapter explores effective policy support in enabling such acceleration. While COVID-19 has sparked some novel applications for age-related technology and increased the adoption of technology, the utilization of age-related technology remains low. Awareness and understanding of technology for active ageing is wanting. Existing regulatory frameworks, infrastructure and human capital are also to be enhanced to provide the necessary support for the realization of the full potentials of technology to support older persons. In this regard,

governments have a critical role in creating enabling policy frameworks to promote the utilization of existing technology as well as the development of new technology for older persons.



Based on the experiences of China, Japan and the Republic of Korea, this Chapter presents some effective policy initiatives that foster a conducive environment to utilize and develop technology in support of older persons. To showcase these policy measures in a systematic manner, they are categorized into four key stages (Table 3.1).

Table 3.1 Four key stages of the technology for active ageing ecosystem

Prerequisite Stage	The prerequisite stage focuses on an enabling environment that is conducive to the full utilization of existing technology as well as the development of new technology. An enabling environment includes: <ul style="list-style-type: none"> • High levels of awareness of technology for active ageing • Inclusive digital and physical infrastructure
Research Stage	The research stage covers the basic research portion of the overall research and development (R&D) process.
Product Development Stage	The product development stage spans the entire research commercialization process before a product enters the market, covering <ul style="list-style-type: none"> • Applied research and prototyping • Product testing, clinical trials and testbeds • Business support
Adoption Stage	The adoption stage takes into consideration the perspectives of both producers and consumers, including: <ul style="list-style-type: none"> • Technological products being sold in the market • Technological products being used in real life

Table 3.2 Summary of case studies under the four key stages of the technology for active ageing ecosystem

Key stages of the technology for ageing ecosystem							
Prerequisite	Research		Product Development		Adoption		
Awareness + Accessibility	Basic research	Applied research	Testbeds	Scaling out	Market entry	User adoption	
(1) GIES (2) Pilot Demonstration (3) Digital Divide (4) Universal Design						(1) (GIES) (2) (Pilot Demonstrations)	
	<i>National Rehabilitation Center Programs:</i> ← (5) R&D Support → (7) TRPRR → (7) Business Support Program →						
	(6) Gerontech Youth Challenge	← (8) Project for Nursing-care Robot Development and Standardization: Standards evaluation → Development subsidy → Impact assessment → (9) Next Generation Medical Infrastructure Act					
					(10) I&T Fund (11) Tech subsidies to companies (12) WERP (Rental Subsidies) (13) Community Care (14) Wuzhen Platform		
					(15) Smile Care Food Classification		

Legend:	
	China (incl. Hong Kong SAR)
	Republic of Korea
	Japan

For each stage, an overview and its different constituent elements will be discussed. Then, the role of the government will be elaborated in relation to various policy initiatives from China, Japan and the Republic of Korea. Finally, each initiative will be examined in detail.

Table 3.2 provides a summary of how all the case studies covered in this Chapter map onto the four stages. As illustrated, many case studies could arguably fall under more than one stage. This is to be expected as the R&D process is a fluid and iterative undertaking. Having said that, policies are classified into the stage that corresponds most with what is determined to be the representative aspect.

A. Prerequisite Stage

The prerequisite stage represents a critical foundation for technology for active ageing. As the structural underpinnings of government intervention, this stage enables subsequent policies to build off and leverage

facilitative ecosystem dynamics. Three elements are particularly important in enabling future policies regarding the technology for active ageing ecosystem:

(1) Raising Awareness

Inadequate awareness of ageing-related technology represents a primary obstacle in encouraging older persons and caregivers to adopt innovative solutions. Failure to engage older persons further translates into commercial difficulties for businesses. Policies that raise awareness about technology for active ageing therefore better enable older persons, caregivers and businesses to meet the various demands associated with ageing societies. (Cases 1 and 2)

(2) Inclusive Digital Infrastructure

One of the many socio-economic issues that the COVID-19 pandemic has highlighted is the digital divide. This is especially true for older persons, who are generally less familiar with and adaptive to new technologies. Policies that actively address the digital divide by providing inclusive digital infrastructure

and web accessibility requirements can facilitate the adoption of technology for active ageing products. (Case 3)

(3) Inclusive Physical Infrastructure

Inaccessible public facilities represent a common impediment to the daily lives of older persons. Despite significant initiatives and ample sums of allocated resources in many countries, older facilities and other public spaces are often being omitted from national improvement efforts. Policies that holistically reconsider physical infrastructure and accessibility can enable a physically inclusive environment that facilitates the adoption of mobility-related technology for active ageing products. (Case 4)

Raising Awareness

Given that many older persons and caregivers are neither aware of technology for active ageing products nor their potential benefits, governments must first

raise awareness about technology for active ageing before considering structural R&D improvements. One of the ways is to provide opportunities for users to try different products and help with public relations and advertising for such initiatives. These opportunities allow end-users to better understand and try out different products, while also enabling businesses to gain user feedback about their products.

Two initiatives in China, the Gerontech and Innovation Expo cum Summit (GIES) and the Pilot Demonstration of Smart Elderly Care Applications, exemplify different ways that governments can help raise public awareness about technology for active ageing. While GIES is an annual event in a single location that allows mass amounts of businesses and citizens to congregate, the Pilot Demonstrations of Smart Elderly Care Applications enable more localized and continual exchange between businesses, citizens and government officials in many Chinese cities.

Case Study 1: Gerontech and Innovation Expo cum Summit (Hong Kong, China)

Department: Innovation and Technology Commission

Key Collaborators: The Hong Kong Council of Social Service (HKCSS), a statutory body coordinating non-profit organizations (NGOs) in the social service field in Hong Kong and Hong Kong Science and Technology Parks Corporation (HKSTP), a statutory body fostering the development of innovation and technology in Hong Kong.

Date: 2017 – present

Brief description: Gerontech and Innovation Expo cum Summit (GIES) is an annual technology for active ageing fair in Hong Kong, China that aims to promote the application of innovative technologies and ideas

to enhance the quality of life for older persons.²⁵

Problem statement: Hong Kong, China has experienced an emergence of local innovation for older persons. However, awareness about technology for active ageing and collaborative dialogues among older persons, caregivers, inventors, policymakers, industry leaders, the general public and other businesses are lacking. GIES provides a platform to bridge the gap in stakeholder collaboration, while raising older persons' and the public's awareness of technology for active ageing.

Policy statement: The Hong Kong Council of Social Service (HKCSS) and Hong Kong Science and Technology Parks (HKSTP) co-host GIES every year. Over the course of the multi-day exhibition, numerous workshops, panels and interactive activities are held to foster understanding and collaboration among stakeholders in Hong Kong's technology for active ageing ecosystem. The 2019 exhibition featured over 500 innovation products from 140 local and international companies.²⁶ As Healthy Ageing is one of HKSTP's core technology focus areas, they consistently have one of the largest pavilions, showcasing products from 29 HKSTP companies in GIES 2019.²⁷

Impact statement: Table 3.3 shows that GIES has continued to attract tens of thousands of attendees, exhibitors, products and media views over the years. Based on a survey for GIES 2018, 94% of exhibitors expressed satisfaction with GIES and 93% of attendees left the event with a better understanding of ageing-related technology products in the market.²⁸ According to a survey following GIES 2019, 70% of respondents had heard of technology for active ageing with 88% having a positive or very positive attitude about the development prospect of technology for active ageing in Hong Kong, China.²⁹

25 The Gerontech and Innovation Expo cum Summit (2020). *Background*. Available at <https://gies.hk/en/site/background>

26 The Gerontech and Innovation Expo cum Summit (2020). *Past Events*. Available at <https://gies.hk/en/site/past-event>

27 Hong Kong Science & Technology Parks Corporation (2019). *HKSTP Leads Park Companies to Showcase Innovative Healthy Ageing Solutions at Gerontech and Innovation Expo cum Summit for Three Years in a Row*. Available at <https://www.hkstp.org/press-room/hkstp-leads-park-companies-to-showcase-innovative-healthy-ageing-solutions-at-gerontech-and-innovation-expo-cum-summit-for-three-years-in-a-row/>

28 The Gerontech and Innovation cum summit (2019). *GIES 2018 Review*. Available at <https://gies2019.hkcss.org.hk/en/site/past-event.html>

29 Lingnan University Jockey Club Gerontechnology and Smart Ageing Project (2020). *Hong Kong Citizens' Awareness and Attitude towards "Gerontechnology" Survey Results*. Available at [https://www.ln.edu.hk/apias/gerontechnology/file/GIES2019%20survey%20result%20\(Eng%20Version\).pdf](https://www.ln.edu.hk/apias/gerontechnology/file/GIES2019%20survey%20result%20(Eng%20Version).pdf)

Table 3.3 Key figures from past iterations of GIES

	Attendees	Exhibition hall area	International exhibitors	Innovative products	Workshops and activities	Media views
2017	43 000+	5,000 sq. m	110	N/A	20	N/A
2018	50,000+	8,424 sq. m	130	400+	60+	270,000+
2019	25,000+	9,500 sq. m	140	530+	70+	340,000+

Sources: GIES (2018), GIES (2019) and GIES (2020).³⁰

Key takeaways: GIES has successfully raised awareness about technology for active ageing among older persons. The exhibition has not only helped bring together end-users and businesses, but also helped facilitate interaction between other stakeholders like researchers, policymakers and international experts. The HKSAR Government has been able to use momentum from GIES to further develop the city's technology for active ageing ecosystem, evidenced by the government's initiative to create a cross-industry, collaborative, city-wide Gerontechnology Platform.³¹

Case Study 2: Pilot Demonstration of Smart Elderly Care Applications in Counties/ Prefectures (China)

Department: Ministry of Industry and Information Technology, Ministry of Civil Affairs and National Health and Family Planning Commission

Date: 2015 – present

Brief description: The Pilot Demonstration of Smart Elderly Care Applications scheme supports selected companies, townships and counties/ prefectures as demonstrators of innovative technology to serve older persons. The involvement of counties/ prefectures is of particular importance since they expose older persons to new technology in their own communities through physical demonstration bases.³²

³⁰ The Gerontech and Innovation Expo cum Summit (2020). *Past Events*. Available at <https://gies.hk/en/site/past-event>; The Gerontech and Innovation Expo cum Summit (2019). *Gerontech and Innovation Expo cum Summit 2019*. Available at <https://gies2019.hkcss.org/hk/en.html>; The Gerontech and Innovation Expo cum Summit (2018) *About Us*. Available at <https://gies2018.hkcss.org/hk/en/node/1.html>

³¹ SIE Fund (2020). *Gerontechnology Platform in Hong Kong*. Available at <https://www.sie.gov.hk/en/what-we-do/gerontech.page>

³² Ministry of Industry and Information Technology, Ministry of Civil Affairs and National Health and Family Commission (2017). 三部门关于开展智慧健康养老应用试点示范的通知. Available at http://www.gov.cn/xinwen/2017-08/05/content_5215984.htm

Problem statement: While many Chinese technology companies have already started developing technology for active ageing products, they experience difficulties in reaching new users. As part of the reason, the lack of awareness makes it difficult to have older persons entrusting in the new products.

Policy statement: In 2017, the Ministry of Industry and Information Technology, Ministry of Civil Affairs and National Health and Family Planning Commission of China issued an action plan for the construction of pilot demonstration zones for smart elderly care.³³ They further issued a “Notice of Three Ministries on the Pilot Demonstration of Smart Elderly Care Applications”, which detailed how the action plan would be carried out.³⁴

Counties/ prefectures that have at least three approved pilot townships can apply to have the entire county/ prefecture piloting integrated smart elderly care systems or services. Successful applicants are provided with government funding, favorable policies, resources and even the opportunity to be advertised through government websites, industry forums, etc. to publicize the demonstration zone and products.³⁵

Impact statement: Since applications opened in 2017, there have been many pilot demonstrations set up across China, including 52 counties and prefectures.³⁶ The first county/prefecture-level demonstration zone in the city of Beijing is located in Zhongguancun, where robotics- and AI-focused pilot demonstrations serve 30 elderly communities, with robots patrolling the streets to check in on older persons, reminding them to take their medication and providing entertainment (Figure 3.1).³⁷

The first pilot demonstration in Guangdong province is in the former Guangzhou Port Sanatorium (Figure 3.2), which services 400 older persons in an area of 30,000 square meters. The home devices use facial recognition and GPS tracking to ensure safety, as well as gadgets to track vital health data.³⁸

33 Ministry of Industry and Information Technology, Ministry of Civil Affairs and National Health and Family Commission (2017). 三部委关于印发《智慧健康养老产业发展行动计划（2017-2020年）》的通知. Available at http://www.gov.cn/xinwen/2017-02/20/content_5169385.htm#1

34 Ministry of Industry and Information Technology, Ministry of Civil Affairs and National Health and Family Commission (2017). 三部门关于开展智慧健康养老应用试点示范的通知. Available at http://www.gov.cn/xinwen/2017-08/05/content_5215984.htm

35 Ibid.

36 Xinhua News (2020). 智慧养老试点示范再启动. Available at http://big5.xinhuanet.com/gate/big5/www.xinhuanet.com/health/2020-07/17/c_1126249360.htm

37 China News (2015). 北京首家智慧养老创新示范基地落户“中国硅谷”. Available at <http://www.chinanews.com/sh/2015/05-06/7257482.shtml>

38 Dayoo News (2020). 广东首个“国家智慧健康养老应用示范基地”正式封顶. Available at https://news.dayoo.com/guangdong/202005/08/139996_53331780.htm

Figure 3.1 Pilot Demonstration Zone in former Zhongguangcuan, Beijing



Source China News (2015).

Figure 3.2 Plan for Pilot Demonstration in Guangzhou Port Sanitorium



Source Dayoo News (2020).

Key takeaways: The above examples illustrate the effectiveness of selecting key districts as pilot demonstration areas in exposing older persons to innovative technology for ageing. Apart from the promotion and adoption of innovative ageing products in the marketplace, such areas allow older persons to have a comprehensive experience of adopting technology in their daily lives, thereby raising awareness of technology for active ageing.

Inclusive Digital Infrastructure

As many technology for active ageing products require the Internet to function, governments can improve adoption rates of ageing-related technologies by helping older persons become more familiar with the Internet. For example, governments can host customized information technology (IT) or assistive technology training programs at local centers. On a

more systematic level, governments can modify web accessibility guidelines to ensure that older persons and persons with disabilities are not excluded from accessing relevant content. The Republic of Korea's Master Plans for Closing the Digital Divide exemplifies the government's holistic efforts towards digital inclusivity.

Case Study 3: First and Second Master Plans for Closing the Digital Divide (Republic of Korea)

Department: Ministry of Information & Communication

Key Collaborators: Korea Agency for Digital Opportunity & Promotion, a government agency dedicated to implementing measures related to closing the digital divide.

Date: 2001 – 2010

Brief description: The First and Second Master Plans for Closing the Digital Divide aim to improve the Republic of Korea's digital literacy and accessibility for marginalized communities, such as older persons.

Problem statement: In 1999, the ROK Government launched Cyber Korea 21, which sought to build up the country's information infrastructure to improve productivity and transform the country into a knowledge-based economy. However, a study indicated that persons aged 60-64 had "no or few" digital skills in 2000.³⁹ Policies measures were launched to support marginalized populations to close the digital divide.⁴⁰

Policy statement: The Digital Divide Act, passed in 2001, required the ROK Government to create a "Master Plan for Closing the Digital Divide" and establish the Korea Agency for Digital Opportunity & Promotion (KADO) to implement the Master Plan.⁴¹ Article 7 explicitly required improvement of digital accessibility for older persons and persons with disabilities.⁴²

³⁹ Park, Han Woo (2002). *The Digital Divide in South Korea Closing and Widening the Divides in the 1990s*. The Electronic Journal of Communication, 12(1-2).

⁴⁰ Watson, Sunnie Lee (2009). *Technology as a Public Good The South Korean Government's Policy on Digital Divide*. Information Technology Education and Society, 10(1), 37-61.

⁴¹ Lee, Insook, Jeung, Hyunju and Kwon, Hyeokjun (2007). *The Korea Agency for Digital Opportunity & Promotion's e-Learning Initiatives to Bridge the Digital Divide in South Korea*. International Journal for Educational Media and Technology, 1(1), 35-47.

⁴² The National Assembly of the Republic of Korea (2006). *정보격차해소에 관한 법률*. Available at <https://law.go.kr/LSW/lsInfoP.do?lsiSeq=72445#0000>

One policy focus of the First Master Plan (2001-2005) was increasing digital literacy, which the ROK Government achieved through widespread IT education courses. Another policy focus was increasing digital accessibility, which the ROK Government did by establishing free internet centers in local community centers, providing assistive technologies and computers to households and creating tailored online content for older persons and persons with disabilities.⁴³

The Second Master Plan (2006-2010) further introduced specialized IT courses for older persons.⁴⁴ It also sought to establish an evaluation system to improve the efficiency of implementing digital divide-related initiatives, as well as created a specific research center dedicated to closing the digital divide.⁴⁵

Impact statement: The Republic of Korea held two sets of national IT courses with great success. The first iteration of national IT courses (2000-2002) trained a total of 13.8 million citizens,⁴⁶ including 442,735 older persons.⁴⁷ The second iteration (2002-2004) included an IT education program for older persons and persons with disabilities. 334,000 older persons attended this course at 202 educational centers.⁴⁸

In terms of accessibility, the ROK Government built more than 8,200 community internet centers and distributed over 88,000 PCs to older persons and persons with disabilities. They further supplied 58,013 information and communication assistive devices to citizens, including 2,278 screen readers for older persons with disabilities.⁴⁹ KADO helped operate the Telecommunication Accessibility Promotion Standard

- 43 Lim, Su-Yeon and Lee, Myeong Ho (2007). *Use of ICT for Bridging Digital Opportunity A Korea's Case*. 2007 International Conference on Convergence Information Technology; Ji, Un-jong (2008). *Korea's Effort to Achieve the Inclusive Digital Society*. Korea Agency for Digital Opportunity & Promotion. Available at <https://archive.caribank.org/uploads/news-events/events/past-conferences-and-workshops/regional-icts-workshop/JI-Korea.pdf>
- 44 Choi, Doojin (2007). *디지털 정보와 정보격차*. Korea Agency for Digital Opportunity & Promotion. Available at <http://old.hsn.or.kr/hsn2007/document/7/II-4.pdf>
- 45 Ministry of Education and Human Resources Development, Ministry of Foreign Affairs and Trade, Ministry of Justice, Ministry of Government Administration and Home Affairs, Ministry of Culture and Tourism, Ministry of Agriculture and Forestry, Ministry of Information and Communication, Ministry of Health and Welfare, Ministry of Labor, Ministry of Gender Equality and Family, Ministry of Oceans and Fisheries, Ministry of Planning and Budget, Small and Medium Business Administration, Broadcasting Committee (2005). *제2차 정보격차해소 종합계획(2006~2010)*. Available at http://img.yonhapnews.co.kr/etc/press/PR/2005/0000235051205144831_1.pdf
- 46 Lim, Su-Yeon and Lee, Myeong Ho (2007). *Use of ICT for Bridging Digital Opportunity A Korea's Case*. 2007 International Conference on Convergence Information Technology.
- 47 Cho, Cheong-Moon (2007). *Policy and the Digital Divide*. Global-ICT 2007. Available at <https://connect-world.com/policy-and-the-digital-divide-in-korea/>
- 48 Ibid.
- 49 Ji, Un-jong (2008). *Korea's Effort to Achieve the Inclusive Digital Society*. Korea Agency for Digital Opportunity & Promotion. Available at <https://archive.caribank.org/uploads/news-events/events/past-conferences-and-workshops/regional-icts-workshop/JI-Korea.pdf>

Forum, which sought to standardize web and telecommunication accessibility for older persons and persons with disabilities.⁵⁰ KADO also developed online content for them.⁵⁰

Following the First Master Plan, the rate of older persons' internet usage rose from 9.3% in 2002 to 28.3% in 2006.⁵² In 2017, the internet usage rate stood at 58.8% for older persons, although the digital divide remained in contrast to the national average of 90.3%.⁵³

Key takeaways: The First and Second Master Plans for Closing the Digital Divide demonstrated the effectiveness that IT training courses and distribution of assistive technologies have in enhancing the willingness and ability of older persons to leverage technology. Further rounds of the like can be implemented to bridge the digital divide, especially in light of how COVID-19 has forced many key services to be moved online.

Inclusive Physical Infrastructure

Certain technologies for active ageing such as mobility aids or smart wheelchairs require accessible physical infrastructures to operate. Governments can therefore improve adoption rates of technology for active ageing products by making physical infrastructures

more accessible. One way to do this is by emphasizing universal design, a design framework that makes physical spaces and products benefit the widest possible range of people and situations.⁵⁴ The General Principles of Universal Design implemented by the Japanese Government offer useful references.

⁵⁰ Cho, Cheong-Moon (2007). *Policy and the Digital Divide*. Global-ICT 2007. Available at <https://connect-world.com/policy-and-the-digital-divide-in-korea/>

⁵¹ Lee, Insook, Jeung, Hyunju and Kwon, Hyeokjun (2007). *The Korea Agency for Digital Opportunity & Promotion's e-Learning Initiatives to Bridge the Digital Divide in South Korea*. International Journal for Educational Media and Technology, 1(1), 35-47.

⁵² Lim, Su-Yeon and Lee, Myeong Ho (2007). *Use of ICT for Bridging Digital Opportunity A Korea's Case*. 2007 International Conference on Convergence Information Technology.

⁵³ Ministry of Science and ICT, I-KOREA 4.0, Korea Internet & Security Agency (2018). *2018 Korea Internet White Paper*. Available at <https://www.kisa.or.kr/jsp/common/downloadAction.jsp?bno=263&dno=6&fseq=2>

⁵⁴ Centre for Excellence in Universal Design, National Disability Authority (n.d.). *The 7 Principles*. Available at <http://universaldesign.ie/What-is-Universal-Design/The-7-Principles/>

Case Study 4: General Principles of Universal Design (Japan)

Department: Ministry of Land, Infrastructure and Transport

Date: 2005 – present

Brief description: The General Principles of Universal Design aim to promote barrier-free public facilities across Japan, including transport systems, housing projects and public areas.⁵⁵ This is done through both physical alteration of infrastructures and usage of ubiquitous network technology.⁵⁶

Problem statement: While Japan had previously passed numerous barrier-free Acts throughout the 1980s, 1990s and early 2000s, all previous Acts only applied to making individual facilities barrier-free, overlooking public spaces. Furthermore, most of the policies were directed at new facilities, leaving existing facilities inaccessible.⁵⁷

Policy statement: Before implementing the universal design principles, the Japanese Government conducted meetings with various stakeholders to get a comprehensive understanding of society's accessibility needs. Implementation was done through a phased process to ensure that feedback and different perspectives were continuously taken into account.⁵⁸ Government employees in various departments were also educated on the General Principles of Universal Design for the implementation of future initiatives.⁵⁹

The policy consists of guidelines on how to implement universal design into physical infrastructures. One is the continuous removal of barriers to support uninterrupted movement by users. For example, a trip from

55 Ministry of Land, Infrastructure and Transport (2005). *General Principles of Universal Design Policy*. Available at <https://www.mlit.go.jp/kisha/kisha05/01/010711/04.pdf>

56 Ubiquitous network relies on ubiquitous computing technology, which is a post-desktop model of human-computer interaction in which information processing has been thoroughly integrated into the objects and surfaces of everyday life such as furniture, clothing, toys, or roads through microprocessors. It allows people to interact with information-processing devices more naturally and casually than with traditional desktop screen-based user interfaces. Devices that use ubiquitous computing can be accessed at anywhere and at any time. Ubiquitous computing is considered as a precursor to Internet of Things technology. Available at <https://www.igi-global.com/dictionary/ubiquitous-computing/30811> and <https://internetofthingsagenda.techtarget.com/definition/pervasive-computing-ubiquitous-computing>

57 Ministry of Land, Infrastructure and Transport (2005). *General Principles of Universal Design Policy*. Available at <https://www.mlit.go.jp/kisha/kisha05/01/010711/04.pdf>

58 Ibid.

59 Ishikawa, Yoshinori (2007). *Training of Japanese Local Government Officials as a Policy of Human Resource Development*. Council of Local Authorities for International Relations, Institute for Comparative Studies in Local Governance and National Graduate Institute for Policy Studies. Available at http://www3.grips.ac.jp/~coslog/activity/01/04/file/Bunyabetsu-2_en.pdf

someone's house to the supermarket should have uninterrupted pathways with wheelchair accessibility. Second is that all public transport must be designed for all users' use, including both the public transportation itself as well as transit points. Third is ensuring that neighborhood buildings and pedestrian spaces are barrier-free so that people with mobility aids can access all nearby facilities and walkways without the need for transportation in a local community.⁶⁰

The policy also promoted the use of ubiquitous network technology to further support older persons and persons with disabilities to travel independently.^{61, 62} For example, portable ubiquitous devices enabled older persons and persons with disabilities to receive real-time information about the best travel routes and transportation methods based on their accessibility requirements.⁶³

Impact statement: With the Tokyo Summer Olympics originally planned for 2020, the Japanese Government had increased efforts to implement the General Principles of Universal Design.⁶⁴ In 2018, 90% of Tokyo train and subway stations, 94% of bus terminals, 100% of passenger ship terminals and 89% of airports were wheelchair accessible. In 2017, there were 5,880 certified barrier-free buildings and 958 public housing projects (25,010 housing units) built with accessibility features.⁶⁵

Key takeaways: The General Principles of Universal Design help create physical infrastructure that allows for more independent and accessible living for older persons and persons with disabilities. Given the design

60 Ministry of Land, Infrastructure and Transport (2005). *General Principles of Universal Design Policy*. Available at <https://www.mlit.go.jp/kisha/kisha05/01/010711/04.pdf> <https://www.mlit.go.jp/kisha/kisha05/01/010711/04.pdf>

61 Ibid.

62 The basic architecture of the ubiquitous network consists of three elements. First is place identification technologies (markers) placed within existing infrastructures such as roads or lampposts, which provide real-time information about their surroundings. Second is a portable ubiquitous device (including cell phones) carried by pedestrians, which communicates relevant information with users. These devices are universally designed to also communicate with people with visual or hearing impairments through audible and tactile guidance. Third are servers, which contain a ucode resolution server and relevant information systems such as the Geographic Information System (GIS). GIS helps create detailed road maps of neighborhoods that provide the shortest and most smooth routes for wheelchair-bound travelers and create tactile maps for people with visual impairments. Available at <https://www.mlit.go.jp/kisha/kisha05/01/010711/04.pdf> For more information Sakamura, Ken, Toya, Yuichi and Oka, Kunihiko (2005). *Conduct of free mobility assistance project*. 12th World Congress on ITS Paper 3978.; Sakamura, Ken (2006). *Challenges in the Age of Ubiquitous Computing A Case Study of T-Engine, An Open Development Platform for Embedded Systems*, 28th International Conference on Software Engineering.

63 Kubo, Shinji, Konuma, Ryouhei, Imaizumi, Kenichi, Watanabe, Yasunobu and Moriuchi, Hiroki (2007). *Aiming to Realize Ubiquitous Services Participation in Verification experiments of Ubiquitous Services for Kobe Airport*. Oki Technical Review Issue 209, 74(1), 4-9.; Ministry of Land, Infrastructure and Transport (2005). *General Principles of Universal Design Policy*. Available at <https://www.mlit.go.jp/kisha/kisha05/01/010711/04.pdf>.

64 Prime Minister of Japan and His Cabinet (2017). *Meeting of the Ministerial Council on Universal Design 2020*. Available at https://japan.kantei.go.jp/97_abe/actions/201702/20article2.html

65 Ministry of Land, Infrastructure, Transport and Tourism (2019). Chapter 7 "Building a Safe and Comfortable Society" of *White Paper on Land, Infrastructure, Transport and Tourism in Japan 2019*. Available at <https://www.mlit.go.jp/common/001325169.pdf>

principles' universal nature, infrastructures are designed to seem less explicitly catered to or discriminatory against older persons.

While barrier-free facilities in public spaces and public transport have improved considerably, more could be done for public housing. Even though over 25,000 housing units have been built with accessibility features, that only accounts for about 1% of Japan's total public housing, which amounted to about 2.17 million in 2016.⁶⁶ As most public housing units were built in the 1970s and 80s, retrofitting work is required to increase the percentage of accessible housing.

B. Research Stage

Funding and expertise are crucial to conduct basic research related to technology for active ageing. Better basic research capacities would in turn enhance subsequent product development and commercialization processes. Policies that foster ample and impactful research findings are typically considered as the defining facets of a successful research environment. To help produce such research findings, governments can strengthen funding and capacity building initiatives to support public and private entities to conduct research on technology for active ageing.

(1) Funding

Targeted research funding can help direct research capabilities in both the public and private sector towards basic research on technology for active ageing and provoke new research opportunities. (Case 5)

(2) Capacity building

Given that technology for active ageing is a relatively new field, there may be neither existing expertise nor burgeoning interest in this field. Policies can help increase researchers' expertise in the field of technology for active ageing, as well as attract interest of younger generations towards it. (Case 6)

Funding

One way that governments can increase the amount of basic research outputs related to technology for active ageing is by setting up permanent, targeted R&D support programs. In the Republic of Korea, the government provides distinct forms of R&D funding for different kinds of technology for active ageing. One of the most comprehensive schemes is the Rehabilitation Research & Development Support Program, an initiative that leads and governs all national R&D programs on rehabilitation research.

⁶⁶ The Japanese Federation of Housing Organizations (2017). *Social Housing Policy in Japan*. Available at http://www.internationalhousingassociation.org/fileUpload_details.aspx?contentTypeID=3&contentID=254956&subContentID=706249&channelID=38488

Case Study 5: Rehabilitation Research & Development Support Program (Republic of Korea)

Department: Ministry of Health and Welfare (MOHW)

Key Collaborator: National Rehabilitation Center (NRC), a government-affiliated agency consisting of a rehabilitation hospital and a rehabilitation research institute that is dedicated to realizing health promotion and community reintegration for persons with disabilities through rehabilitation medicine, research and education.

Date: 2011 – present

Brief description: The Rehabilitation Research & Development (R&D) Support Program leads and governs the national R&D programs on rehabilitation research for persons with disabilities, including older persons, in the Republic of Korea.⁶⁷

Problem statement: Population ageing is associated with a growing population of people with disabilities, creating a rising demand for R&D to better support them. However, as this population group remains marginalized, they have been considered to have low market value. This results in insufficient private investments and R&D programs into the market for older persons and persons with disabilities. Public investment in rehabilitation R&D is thus essential.⁶⁸

Policy statement: The Rehabilitation R&D Support Program aims to identify key rehabilitation themes and make R&D investments that provide continuous rehabilitative health care services. The program covers nine rehabilitation areas,⁶⁹ one of which is practical research for the development of assistive technologies.

To facilitate programming, the R&D Support Program is split into two sub-programs – an extramurally conducted basic research program outsourced to companies, other research institutes and universities and

⁶⁷ National Rehabilitation Center (n.d.). *Rehabilitation Research & Development Support Program*. Available at http://www.nrc.go.kr/eng/html/content.do?depth=n_ri&menu_cd=02_03_02

⁶⁸ Ibid.

⁶⁹ The nine rehabilitation areas are (1) Public Health, (2) Clinical Rehabilitation Interventions, (3) Assistive Technology, (4) Rehabilitation Policy, (5) Rehabilitation Evaluation Tools, (6) Society Reintegration, (7) Rehabilitative Exercises, (8) International Rehabilitation Research and (9) Public Planning Area. Available at http://www.nrc.go.kr/eng/html/content.do?depth=n_ri&menu_cd=02_03_02

an intramurally conducted applied research program carried out at NRC's own clinical trial testbeds.⁷⁰ The testbeds include rehabilitation research on the effective use of medical and assistive devices.⁷¹

Impact statement: Over the past decade, the R&D Support Program has supported a number of basic research projects. For example, in 2019, the Program supported a quantitative research study conducted at Yonsei University on nerve recovery by rehabilitation of stroke patients using brain imaging.⁷² The Program also supported stem cell research for application in rehabilitation medicine conducted at Dankook University in 2014.⁷³

Key takeaways: This case demonstrates the effectiveness of public R&D funding on areas of research that have high social value but insufficient private interest, such as rehabilitation R&D. However, as older persons and persons with disabilities struggle with many medical issues aside from rehabilitation, more could be done to provide comprehensive R&D funding and planning for other areas.⁷⁴

Capacity building

To foster the research development of technology for active ageing, it is important to arouse younger generations' interest towards the field. Given the interest of young people in technology, policies that provide

opportunities for them to engage with technology for active ageing could attract them to develop their expertise in the field. This is an opportunity provided by the Gerontech Youth Challenge in Hong Kong, China.

70 National Rehabilitation Center (n.d.). *Rehabilitation Research & Development Support Program*. Available at http://www.nrc.go.kr/eng/html/content.do?depth=n_ri&menu_cd=02_03_02

71 The Clinical Rehabilitation Testbed includes four research areas (1) Testbed on Physical Medicine & Rehabilitation, (2) Testbed on Medical and Assistive Devices, (3) Testbed on Clinical Evaluations and Measurements, Guidelines and Services and (4) Testbed on Applications of Planning and Research. Available at http://www.nrc.go.kr/eng/html/content.do?depth=n_ri&menu_cd=02_03_02

72 National Rehabilitation Center (2019). *뇌영상을 이용한 뇌졸중 환자의 재활에 의한 신경회복 정량화 평가에 관한 연구*. Available at http://www.nrc.go.kr/research/board/boardView.do?no=17502&fno=37&depart_no=&menu_cd=05_02_00_01&board_id=NRC_NOTICE_BOARD&bn=newsView&search_item=&search_content=&pageIndex=1#

73 National Rehabilitation Center (2014). *재활의학 적용을 위한 줄기세포 연구개발 및 임상시험 현황조사 기획연구*. Available at http://www.nrc.go.kr/research/board/boardView.do?no=17420&fno=37&depart_no=&menu_cd=05_02_00_01&board_id=NRC_NOTICE_BOARD&bn=newsView&search_item=1&search_content=&pageIndex=9#

74 While NRC's primarily focuses on rehabilitation-related research, the Center has also expanded their R&D support to other technology for active ageing, especially relating to assistive technologies. The NRC's Assistive Technology R&D Project for People with Disabilities and the Elderly offers R&D funding to assistive technologies that either have particularly high market growth potential or particularly high social value, but which are difficult to industrialize due to low demand and high production costs. Devices of the latter category are developed at the Assistive Technology Open Lab located in NRC. Available at http://www.nrc.go.kr/eng/html/content.do?depth=n_ri&menu_cd=02_03_06 In addition, the Republic of Korea's Ministry of Health and Welfare and Ministry of Trade, Industry and Energy also jointly launched a three-year care robot R&D project with a total budget of KRW 1.3 billion in 2019. Of the KRW 1.3 billion, KRW 400 million is specifically dedicated to R&D of smart caring service models for older persons at the Korea Institute of Industrial Technology. The budget was increased to KRW 2.2 billion in 2020. Available at <http://www.koreaherald.com/view.php?ud=20190603000581> and https://www.motie.go.kr/motie/ne/announce2/bbs/bbsView.do?bbs_cd_n=6&biz_anc_yn_c=Y&bbs_seq_n=66008

Case Study 6: Gerontech Youth Challenge (Hong Kong, China)

Department: Hong Kong Electrical and Mechanical Services Department (EMSD)

Key Collaborator: Hong Kong Council of Social Service (HKCSS), a statutory body coordinating NGOs in the social service field in Hong Kong.

Date: 2017 – present

Brief description: Gerontech Youth Challenge is an annual competition designed to encourage Hong Kong youths to translate their expertise in technology and electrical and mechanical (E&M) fields into innovative care products for older persons.⁷⁵

Problem statement: Innovation in technology for active ageing is primarily driven by businesses and institutions. However, a study suggested that a significant factor in adopting modern technology among older persons included the desire to connect with the younger generation.⁷⁶ Despite the notable influence of youths on seniors, efforts to engage youths in solving ageing-related issues have been lacking.

Policy statement: Inspired by the positive response from the Gerontech and Innovation Expo cum Summit (GIES), the HKCSS partnered with the EMSD to host the Gerontech Youth Challenge. The competition encourages youths with knowledge of technology or E&M to develop innovative products for older persons in community, institutional, or home care.⁷⁷

Students in primary and secondary school are put into their respective age divisions, whereas the inclusive division requires the inclusion of a member over the age of 60 in the team. This facilitates a collaborative partnership that provides youths active user feedback from older persons. Participants are only required to submit a written design report, rather than physical models. Winners are awarded with monetary prizes and a donation to a social organization of their choice.⁷⁸

⁷⁵ Electrical and Mechanical Services Department (2017). *Gerontech Youth Challenge*. Available at https://emya.emsd.gov.hk/en/new-activities/index_id_9.html

⁷⁶ Chen, Ke and Chan, Alan Hoi-shou (2013). *Use or Non-Use of Gerontechnology – A Qualitative Study*. *International Journal of Environmental Research and Public Health*, 10(10), 4645-4666.

⁷⁷ Electrical and Mechanical Services Department (2017). 社區關懷活動「樂齡科技顯愛心」。 Available at <https://emya.emsd.gov.hk/tc/past-activities/2017-gerontech-youth-challenge/index.html>

⁷⁸ Ibid.

Impact statement: The competition attracted a significant number of students to participate and develop innovative ideas. More than 90 teams participated in the inaugural 2017 Challenge,⁷⁹ and 72 teams from over 40 schools came together to participate in the 2018 cycle.⁸⁰ The 2018 winners invented a smart device to remind older persons facing cognitive decline of necessary functions, such as turning off stoves before leaving their homes.⁸¹ Product demonstrations at the competition's annual award ceremonies also present opportunities to educate and train older persons about technology for active ageing products.

Key takeaways: A key aspect of the Gerontech Youth Challenge is successfully expanding the technology for active ageing ecosystem and industry beyond conventional, older institutional voices to incorporate more youth perspectives. The "inclusive division" category presents a particularly novel way to bridge the intergenerational gap between older and younger persons. More follow-ups could be done to enable teams to further pursue their projects after the competition.

C. Product Development Stage

The product development stage is an intermediary phase that translates basic research about technology for active ageing into functional ageing-related technologies for the market. However, obtaining user feedback for product trials and enhancement is particularly challenging, as companies cannot easily approach end-users and older persons are less willing to try new products.⁸² Government support can help provide businesses with opportunities to obtain user input during the product development stage. It can be achieved by improving accessibility to testbeds, helping businesses with scaling and sharing relevant public health care data.

(1) Testbeds

Different types of testbeds are required for each sub-stage of the technology for active ageing product development process. When conducting translational and applied research, testbeds are necessary to decide best clinical practices for older persons. When building and testing prototypes, testbeds are necessary to determine prototypes' safety and effectiveness. When enhancing products, testbeds are necessary to receive feedback from older persons and caregivers. Policies that provide companies with various types of testbeds would greatly facilitate the product development process. (Case 7)

79 Information Services Department (2018). *Youths show gerontech genius*. Available at https://www.news.gov.hk/eng/2018/02/20180214/20180214_183005_581.html

80 Development Bureau (2019). *Gerontechnology products in the community*. Available at https://www.devb.gov.hk/en/home/my_blog/index_id_331.html

81 Ibid.

82 Our Hong Kong Foundation (2017). *Gerontechnology Landscape Report*. Available at https://www.ourhkfoundation.org.hk/sites/default/files/media/pdf/healthtech_eng_cover_ss.pdf

(2) Scaling

Scaling technology for active ageing is inherently challenging because many technologies have high production costs and many end-users such as older persons or care institutions have limited budgets. Policies that subsidize businesses' costs in the product development stage can make this process smoother. Scaling out overseas presents the additional challenge of products often having stringent and local licensing, certification and safety requirements. Policies that support standardization can help address this issue. (Case 8)

(3) Data

Data allows technology companies to refine products according to user feedback and clinical results from older persons. Policies that allow private companies to access public health care-related data can therefore facilitate the product development process. (Case 9)

Testbeds

Businesses need access to different types of testbeds throughout the product development stage to receive user feedback at different stages of the product creation and enhancement process. However, companies may find it difficult to approach end-users such as older persons or caregivers for testing purposes. Companies therefore can benefit from government support that improves access to relevant testbeds of target end-users. Different policy initiatives under the Republic of Korea's National Rehabilitation Center (NRC) have helped rehabilitation robot product developers to access different types of rehabilitation-related testbeds at different stages of the product development process. The NRC's Translational Research Program for Rehabilitation Robots and Business Support Program for Rehabilitation Robots have demonstrated how integrated service provision can overcome testbed-related challenges.

Case Study 7: Translational Research Program for Rehabilitation Robots & Business Support Program for Rehabilitation Robots (Republic of Korea)

Department: Ministry of Health and Welfare (MOHW) and Ministry of Trade, Industry and Energy (MOTIE)⁸³

Key Collaborators: National Rehabilitation Center (NRC), a government-affiliated agency consisting of a rehabilitation hospital and a rehabilitation research institute that is dedicated to realizing health promotion and community reintegration for persons with disabilities through rehabilitation medicine, research and education and Korea Institute for Robot Industry Advancement (KIRIA),⁸⁴ a government-affiliated agency

⁸³ Ministry of Trade, Industry and Energy only involved with Business Support Program for Rehabilitation Robots.

⁸⁴ KIRIA only involved with Business Support Program for Rehabilitation Robots.

dedicated to promoting and developing the Republic of Korea's robot industry through business support and policy development.⁸⁵

Date: 2012 – present

Brief description: The Translational Research Program for Rehabilitation Robots (TRPRR) and Business Support Program accelerate clinical applications of rehabilitation robots through the provision of testbeds.

Problem statement: Academic literature has suggested that researchers experience difficulty in translating basic research on rehabilitation robots into clinical application due to stringent safety requirements, lack of demonstrative effectiveness and limited long-term investment.⁸⁶ Aside from the lack of clinical trials, prototype complexity and reproducibility further hinder successful commercialization.⁸⁷ The lack of testbeds specifically catered to rehabilitation robot research is therefore a key problem of the product development process of rehabilitation robots.

Policy statement: The main purpose of TRPRR is to support translational research on rehabilitation robots, which works to bridge the gap between technical, engineering-oriented basic research and human-centric clinical research. Translational research essentially consists of product enhancement, testing, certification and clinical trials.⁸⁸ Certification is issued by the Ministry of Food and Drug Safety to enable doctors to pursue further clinical research.⁸⁹

To assist with translational research, TRPRR helps run the Rehabilitation Robotic Gym, a testbed with various rehabilitative robots serving multiple purposes for different parties. For patients, the gym maximizes patient recovery using therapeutic robots. For clinicians and medical researchers, the gym helps build a scientific basis for best rehabilitation practice. For engineers, the gym offers an opportunity to conduct clinical trials and receive user feedback. Figure 3.3 illustrates some of the robotic gym equipment that is available at the NRC's Rehabilitation Robot Gym.

85 Korea Institute for Robot Industry Advancement (n.d.). *About KIRIA*. Available at <https://kiria.org/eng/aboutMission.do>

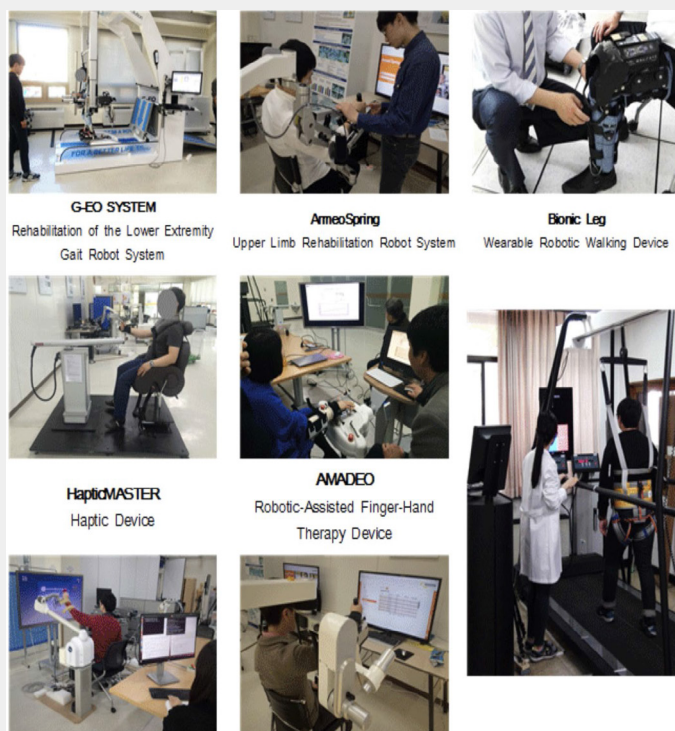
86 Song, Won-Kyung (2016). *Trends in rehabilitation robots and their translational research in National Rehabilitation Center, Korea*. Biomedical Engineering Letters, 6(1), 1-9.

87 Grosu, Victor, Rodriguez-Guerrero, Carlos, Grosu, Svetlana, Leu Adrian, Ristic-Durrant, Danijela, Vanderborgt, Bram and Lefeber, Dirk (2015). *Real Time physical layer architecture for robot-assisted gait rehabilitation device*. International Conference on Rehabilitation Robotics 2015.

88 Song, Won-Kyung (2019). *From Research to Practice Bridging robotics research with clinical value in Korean municipal healthcare*. National Rehabilitation Center. Available at https://www.whinn.dk/media/1799/8-song-191120e_whinn2019_wksong_.pdf

89 Song, Won-Kyung (2016). *Trends in rehabilitation robots and their translational research in National Rehabilitation Center, Korea*. Biomedical Engineering Letters, 6(1), 1-9.

Figure 3.3 Major devices of the Rehabilitation Robot Gym



Source National Rehabilitation Center.

The Business Support Program selects outstanding rehabilitation robots⁹⁰ annually for piloting at different national hospitals and rehabilitation centers, such as the NRC.⁹¹ The pilot program functions as a testbed platform that enables participating businesses to receive user feedback for clinical application and product enhancement. The pilot program is supervised by a project group that helps businesses manage research operations, selects and administers partner institutions and assists with clinical verification, licensing and insurance arrangements of selected robots.⁹²

Impact statement: From 2013 to January 2017, TRPRR achieved significant research outputs, which include 113 conference papers, 30 journal papers, 27 clinical trials, 34 prototypes, 60 patent applications, 11 patent

⁹⁰ Annually selected robots are from a variety of different businesses and not necessarily from TRPRR.

⁹¹ National Rehabilitation Center. *Business Support Program for Rehabilitation robots*. Available at http://www.nrc.go.kr/eng/html/content.do?depth=n_rj&menu_cd=02_03_04

⁹² Korea Institute for Robot Industry Advancement (2016). *A Rehabilitation Robot Business Support Project*. Available at https://nd.narangdesign.com/mail/icos/201611_en/sub3.html

registrations and 2 technology transfers.⁹³ By 2019, rehabilitation robots from the Business Support Program have been connected and deployed at over 30 institutions. One particularly successful product is ANGELEGS, which assists lower-limb motions of people with partial or temporary impairments.⁹⁴ The product ranked 3rd in Cybathlon Powered Exoskeleton Race 2016 and was the final entry in UAE AI & Robotics for Good 2018 competitions. ANGELEGS piloted at four institutions from 2016 to 2020 and has already started to see record sales.⁹⁵

Figure 3.4 ANGELEGS



Source: National Rehabilitation Center.

Key takeaways: TRPRR and the Business Support Program show the importance of testbeds in the product development stage and demonstrate how government policies can effectively provide such facilities to rehabilitation robot businesses. The provision of testbeds should not be limited to rehabilitation robot developers, but could be extended to other technology for active ageing such as care robots or assistive devices.⁹⁶

Scaling

Policies that subsidize production costs can help technology for active ageing businesses scale. To help companies expand overseas, policies should also facilitate standardization to make recognition by overseas parties easier. The Project to Promote the Development and Standardization of Robotic Devices for Nursing Care in Japan covers both areas,

by providing development subsidies to businesses creating nursing-care robots, as well as providing standards formation and evaluation subsidies to create industrial standards for nursing-care robots. The Project further offers impact assessment subsidies to empirically prove the effectiveness of nursing-care robots in practice.

⁹³ National Rehabilitation Center (n.d.). *Translational Research Program for Rehabilitation Robots (TRPRR)*. Available at http://www.nrc.go.kr/eng/html/content.do?depth=n_ri&menu_cd=02_03_03

⁹⁴ Song, Won-Kyung (2019). *From Research to Practice Bridging robotics research with clinical value in Korean municipal healthcare*. National Rehabilitation Center. Available at https://www.whinn.dk/media/1799/8-song-191120e_whinn2019_wksong_.pdf

⁹⁵ Other successful robots include the Walkbot-S, a gait training machine with virtual reality, lower limb exoskeleton, treadmill and body weight support that achieved higher sales and successful penetration into Chinese, Russian and Turkish markets following the Program. Another product is the RAPAE Smart Glove developed by Neofect Inc., which allows patients to train their fingers, wrist and arms by playing different games. The RAPAE Smart Glove has been adopted in ten of Korea's largest hospitals and expanded into the US and European markets, with plans to expand into the Japanese and Chinese markets. Available at https://test.narangdesign.com/mail/icros/201611_en/sub4.html

⁹⁶ NRC recently started a Translational Research Program for Care Robots. Available at http://www.nrc.go.kr/eng/html/content.do?depth=n_ri&menu_cd=02_03_05

Case Study 8: Project to Promote the Development and Standardization of Robotic Devices for Nursing Care (Japan)

Department: Ministry of Economic, Trade and Industry (METI)

Key Collaborator: Japan Agency for Medical Research and Development (AMED), a government-affiliated agency promoting integrated research and development in the field of medicine, from basic research to clinical trials.

Date: 2013 – present

Brief description: The Project to Promote the Development and Standardization of Robotic Devices for Nursing Care provides different kinds of subsidies related to the product development, standards development and impact assessment of nursing care robots.⁹⁷

Problem statement: Companies that develop nursing-care robots have difficulty sustaining high production costs due to initially low adoption rates. One reason for low adoption rates was that caregivers found nursing-care robots impractical and difficult to use.⁹⁸ Furthermore, there was insufficient incentive from the private sector to develop industrial safety standards and evaluation mechanisms and to assess impact of nursing-care robots.

Policy statement: Started in 2013, the Project to Promote the Development and Introduction of Robotic Devices for Nursing Care has had a total budget of JPY 13.58 billion⁹⁹ to offer three distinct but interrelated subsidies (1) development subsidies, (2) standards formation and evaluation subsidies and (3) impact assessment subsidies.¹⁰⁰

97 Japan Agency for Medical Research and Development (2019). *Project to Promote the Development and Standardization of Robotic Devices for Nursing Care*. Available at <https://www.amed.go.jp/en/program/list/12/02/001.html>

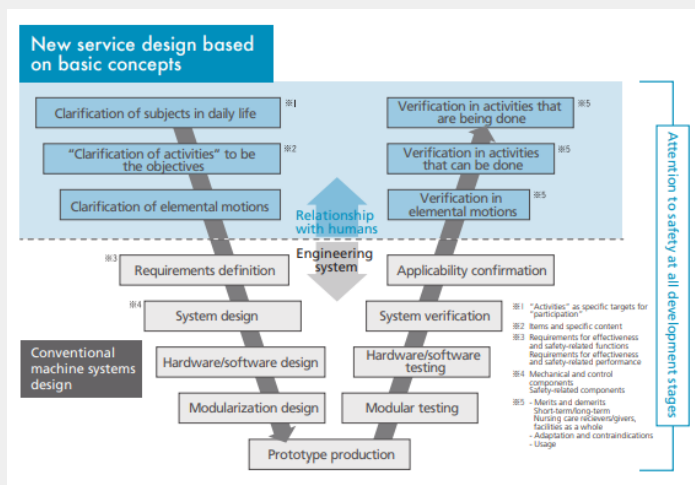
98 Kobayashi, Takeshi (2017). *Development and Promotion of Nursing-Care Robots*. Division of the Support for Elderly Health and Welfare, Health and Welfare Bureau for the Elderly, Ministry of Health, Labor and Welfare. Available at https://gies2017.hkcss.org.hk/images/presentation/W1_Kobayashi_170616.pdf

99 Mitsubishi Research Institute, Inc. (2020). *ロボット介護機器開発・標準化事業等の成果、課題及び今後の事業運営に係る分析報告書*. Available at <https://www.amed.go.jp/content/000070387.pdf>

100 Japan Agency for Medical Research and Development (2019). *Project to Promote the Development and Standardization of Robotic Devices for Nursing Care*. Available at <https://www.amed.go.jp/en/program/list/12/02/001.html> <https://www.amed.go.jp/en/program/list/12/02/001.html>

The first kind of subsidy, development subsidies, is given to private enterprises that desire to develop nursing care robots in specified priority areas, namely transfer aids, mobility aids, toileting aids, bathing aids and monitoring and communication aids.^{101,102} Accepted companies must use a “service design” concept to develop robots, which is a design process focused on human relationship.¹⁰³ As illustrated by the blue boxes in Figure 3.5, nursing-care robot developers must interact with end-users before and after the conventional machine systems design process to clarify and verify the purpose and functionality of their products. In particular, developers must pay attention to the usefulness and safety of their robots,¹⁰⁴ for instance, by conducting simulation at AMED’s safety verification facilities that avoids putting strain on actual human bodies.¹⁰⁵

Figure 3.5 Stages of Project to Promote the Development and Standardization of Robotic Devices for Nursing Care¹⁰⁶



Source Japan Agency for Medical Research and Development & National Institute of Advanced Science and Technology.

- 101 Ibid.
- 102 The list of priority areas was jointly determined by the Ministry of Economy, Trade and Industry and Ministry of Health, Labour and Welfare. Available at https://www.meti.go.jp/english/press/2014/pdf/0528_04.pdf
- 103 Japan Agency for Medical Research and Development and National Institute of Advanced Industrial Science and Technology (n.d.). *Project to Promote the Development and Introduction of Robotic Devices for Nursing Care*. Available at http://robotcare.jp/data/etc/ROBOT-CARE-pamphlet_eng.pdf
- 104 Japan Agency for Medical Research and Development (2013). *開発コンセプトシート作成のポイント*. Available at http://robotcare.jp/data/etc/SG-1-2_development_help.pdf
- 105 Japan Agency for Medical Research and Development and National Institute of Advanced Industrial Science and Technology (n.d.). *Project to Promote the Development and Introduction of Robotic Devices for Nursing Care*. Available at http://robotcare.jp/data/etc/ROBOT-CARE-pamphlet_eng.pdf
- 106 Ibid.

The second kind of subsidy, standards formation and evaluation subsidies, is provided to a consortium of national R&D institutions and industry-specific associations¹⁰⁷ to develop various types of industrial standards for nursing-care robots. This includes developing safety evaluation standards and impact assessment standards for nursing-care robots.¹⁰⁸ They also perform public relations work to internationalize the developed standards.^{109,110}

The third kind of subsidy, impact assessment subsidies, started in 2018 after impact assessment standards were formulated through the aforementioned standards formation and evaluation subsidies scheme. Impact assessment subsidies are provided to a consortium of academic and medical institutions that create empirical models to scientifically evaluate the impact of nursing-care robots developed by the development subsidies scheme.^{111,112}

Impact statement: As of 2020, the development subsidies program has accepted 108 products,¹¹³ with 39 products released to market.¹¹⁴ Of the commercialized products, a few have begun impact assessment, including mobility aid KeePace by Kowa Co. Ltd.¹¹⁵ and a toileting aid by Aronkasei Co. Ltd.¹¹⁶ The standards

- 107** More information on which institutions are in the consortium is available at http://robotcare.jp/data/etc/ROBOT-CARE-pamphlet_eng.pdf
- 108** Hirukawa, Hirohisa (2017). *Overview of Robotic Devices for Nursing Care Project*. Studies in Health Technology and Informatics. 242, 449-456.
- 109** Japan Agency for Medical Research and Development (2019). 標準化推進 (移乗介助 (装着型) 、見守り支援 (介護施設型、在宅介護型)) . Available at <http://robotcare.jp/en/outcomes/09.php>
- 110** More information on other JIS standards involved is available at page 101 of <https://www.slideshare.net/futurewatch/future-watch-trends-of-healthcare-robots-in-japan>
- 111** Japan Agency for Medical Research and Development (2019). *Project to Promote the Development and Standardization of Robotic Devices for Nursing Care*. Available at <https://www.amed.go.jp/en/program/list/12/02/001.html>
- 112** The impact assessments are being conducted at two sites in Japan – the National Center for Geriatrics and Gerontology and the Ouchi Hospital. At National Center for Geriatrics and Gerontology, approved research projects aim to show how nursing-care robots empower older persons, reduce the burden of care workers and increase operational efficiency in long-term care institutions. At Ouchi Hospital, researchers will determine the operational value of robotic devices at different stages of ageing-related nursing care such as acute phase, chronic phase and end-of-life phase. Available at <https://www.amed.go.jp/content/000070387.pdf>
- 113** A full list of all approved robots is available at <http://robotcare.jp/jp/development/index.php?PHPSESSID=cercia3kd40lj3uq3cejtq1d5p&PHPSESSID=cercia3kd40lj3uq3cejtq1d5p>
- 114** Mitsubishi Research Institute, Inc. (2020). ロボット介護機器開発・標準化事業等の成果、課題及び今後の事業運営に係る分析 報告書. Available at <https://www.amed.go.jp/content/000070387.pdf>.
- 115** Japan Agency for Medical Research and Development (2019). 倒立振子技術を応用した移動支援機器 (株式会社幸和製作所) . Available at http://robotcare.jp/jp/development/03_04.php
- 116** Japan Agency for Medical Research and Development (2019). 真空式水洗ポータブルトイレキューレット (アロン化成株式会社) . Available at http://robotcare.jp/jp/development/05_04.php

formation and evaluation subsidies led to several industrial standards publications¹¹⁷ such as the “Guidebook for Development of Robotic Devices for Nursing Care”, “Safety Handbook for Development of Robotic Devices for Nursing Care”, “Robot Aid Device Verification Test Guidelines” and “Robot Aid Device Evaluation Guidelines”.¹¹⁸ These nursing care robot-specific industrial standards were adopted into the set of Japanese Industrial Standards published on 20 April 2016.¹¹⁹

Key takeaways: A reason for the Project’s success is that it incentivizes the incorporation of end-user experiences throughout the product design process and impact assessments. This ensures that robots are not only technologically sophisticated, but also human-centric as well as safe and effective in practical application. The Project’s focus on standards formation further contributes to the international harmonization of service robots’ industrial standards,¹²⁰ which will facilitate the industry’s continual market growth.

Data

Government can help health care-related businesses with product development by providing anonymous patient data from public hospitals for R&D activities. It can assist the private sector in identifying domestic

market needs of older persons and creating innovative health solutions to address the social needs. The Next Generation Medical Infrastructure Act in Japan is an example of such a policy initiative.

¹¹⁷ A full list of published material is available at page 33-35 of <https://www.amed.go.jp/content/000070387.pdf>.

¹¹⁸ Japan Agency for Medical Research and Development (2019). *Project Results*. Available at <http://robotcare.jp/en/outcomes/index.php?lang=en&PHPSESSID=cercia3kd40lj3uq3cejtq1d5p>

¹¹⁹ Team Finland (2017). *Trends of Healthcare Robots in Japan*. Available at <https://www.slideshare.net/futurewatch/future-watch-trends-of-healthcare-robots-in-japan>

¹²⁰ Research conducted in 2009-2013 by national R&D agency New Energy and Industrial Technology Development Organization (NEDO) established safety standards, safety test methods and a certification scheme for service robots. After NEDO proposed this standard to the International Organization for Standardization (ISO), ISO13482 (Robots and robotic devices – Safety requirements for personal care robots) was successfully issued on 1 February 2014 as the international safety standard for service robots. Industrial standards specific to nursing-care robots, formulated through the Project’s standards formation and evaluation subsidies, have been submitted to ISO for consideration to revise ISO13482. Available at https://www.meti.go.jp/english/press/2019/0520_003.html and <http://robotcare.jp/jp/outcomes/09.php?PHPSESSID=ct6uouet44r9j5ka84bpr88db1>

Case Study 9: Next Generation Medical Infrastructure Act (Japan)

Department: Office of Health Care Strategies, Prime Minister's Office¹²¹

Date: 2018 – present

Brief description: The Next Generation Medical Infrastructure Act allows hospitals and clinics to share medical records, upon having patients' consent, with governmentally accredited private companies and eventually with public and private agencies after anonymization for technological research and development purposes.¹²²

Problem statement: In Japan's previous system, medical fee records (i.e., requests for fee reimbursements filed by hospitals and clinics under the nation's universal health care system) were available for research and were particularly useful for health insurance research. These records, however, only include data on medical fees, procedures performed and drugs prescribed. Treatment outcomes were only available when researchers studied individual patients with their consent. Limited data was available on treatment outcomes due to concerns about patient privacy and data breaches.¹²³ This lack of comprehensive data was a hurdle for clinical researchers and private R&D entities, inhibiting analysis to identify the most urgent health care needs and their possible solutions.

Policy statement: The Next Generation Medical Infrastructure Act enables data to be transferred anonymously from clinics and hospitals through data-handling private companies and eventually to research agencies. To achieve this, hospitals have a standard procedure to follow. If patients do not opt out beforehand,¹²⁴ hospitals can provide patients data to the governmentally accredited private company. An anonymized medical database consisting of different user entities has been made available.¹²⁵

121 Maruyama, Eiji (2017). Page 20 of *Japanese Effort to Utilize Medical Big Data The Enactment of the Next-Generation Medical Infrastructure Act, 2017*. World Association for Medical Law 2019 Annual Congress. Available at <http://www2.kobe-u.ac.jp/~emaruyam/medical/Lecture/slides/190807BigData190804C.pdf>

122 Otake, Tomoko (2017). *Medical big data to be pooled for disease research and drug development in Japan*. The Japan Times. Available at <https://www.japantimes.co.jp/news/2017/05/15/reference/medical-big-data-pooled-disease-research-drug-development-japan/>

123 Ibid.

124 Ibid.

125 Maruyama, Eiji (2017). Page 25 of *Japanese Effort to Utilize Medical Big Data The Enactment of the Next-Generation Medical Infrastructure Act, 2017*. World Association for Medical Law 2019 Annual Congress. Available at <http://www2.kobe-u.ac.jp/~emaruyam/medical/Lecture/slides/190807BigData190804C.pdf><http://www2.kobe-u.ac.jp/~emaruyam/medical/Lecture/slides/190807BigData190804C.pdf>

Impact statement: Since the Act's implementation in 2018, technology companies have used the data to understand market needs. For example, a company called Sompo created the Future Care Lab in 2019, whose primary function is to use the available data to research new technologies.¹²⁶ With data suggesting that people had difficulties with mobility, the lab created mobility-oriented products such as self-driving and bed-transforming wheelchairs. Another example is Shichifukujin, a company that used diabetes patient data to develop an app that enables people to self-regulate their diet and lifestyle.¹²⁷ The app measures users' blood sugar, heart rate, weight and activity levels to recommend dietary and lifestyle regimes. User information is also uploaded to a cloud server that can be accessed by physicians for monitoring, while gathering more data for analyses.

Key takeaways: Big data can nurture better research and development in the health care and technology industry, which is of particular importance to ageing societies. This case study shows that the Japanese Government has enabled data to be transferred anonymously by easing regulations, while the centralization of data allows easy and straightforward access from all parties. Privacy and compliance issues however have to be carefully assessed when data is retrieved for research and development purposes. Furthermore, the data collected could inform government policy. For example, the government could accelerate approval and licensing for products supported by empirical data of needs, such as the aforementioned wheelchair, as they are demonstrably valuable for meeting social needs.

D. Adoption Stage

The adoption stage leverages infrastructures and resources from preceding stages to conduct concluding functions within the technology for active ageing ecosystem. While private businesses could directly contribute to the research and product development, inadequate procurement and employment of ageing-related technologies by older persons and care homes

cannot be resolved solely by the private sector.

The primary barrier for adoption is the gap between suppliers' high price points and end-users' budgetary constraints. Government intervention through policies aiding the procurement or direct acquisition is thus required. The different approaches can be summarized as product-based initiatives, community-based initiatives and distribution-related initiatives.

¹²⁶ Rosmino, Claudio (2019). *Japan's technology leads the way in caring for the elderly*. euronews. Available at <https://www.euronews.com/2019/10/29/japan-leads-the-way-with-elderly-care>

¹²⁷ Otake, Tomoko (2018). *Japan doctors tap health-monitoring app to help diabetics keep dialysis at bay*. The Japan Times. Available at <https://www.japantimes.co.jp/news/2018/02/08/national/science-health/japan-doctors-tap-health-monitoring-app-help-diabetics-keep-dialysis-bay/>

(1) Product-based initiatives

Product-based initiatives are policies that either subsidize product procurement for end-users such as older persons and service units or provide subsidies for companies to sell products at lower price. (Cases 10, 11 and 12)

(2) Community-based initiatives

Community-based initiatives are policies that integrate various kinds of ageing-related technologies into a community, e.g., safety-enhancing technologies placed in the homes of older persons or technologies that enhance and optimize the delivery of age-related services to older persons. (Cases 13 and 14)

(3) Labeling initiatives

Labeling initiatives are policies that create frameworks

assisting with the distribution of products between businesses, end-users and medical practitioners. (Case 15)

Product-based initiatives

One way that governments can support widespread adoption of ageing-related technology products is by targeting service providers. Government capital can directly address the lack of funds experienced by many service providers. The impact of the subsidy extends far beyond the individual organization to countless recipients. The I&T Fund in Elderly and Rehabilitation Care in Hong Kong is an example of an effective public initiative targeting domestic service providers.

Case Study 10: I&T Fund for Application in Elderly and Rehabilitation Care (Hong Kong, China)

Department: Hong Kong Social Welfare Department

Key Collaborator: The Hong Kong Council of Social Service (HKCSS), a statutory body coordinating NGOs in the social service field in Hong Kong.

Date: 2018 – present

Brief description: The Innovation and Technology Fund for Application in Elderly and Rehabilitation Care (I&T Fund) is a government subsidy for service units that caters to older persons or persons with disabilities to procure, rent and trial use technology products.¹²⁸

¹²⁸ Social Welfare Department (2020). *Innovation and Technology Fund for Application in Elderly and Rehabilitation Care*. Available at https://www.swd.gov.hk/en/index/site_pubsvc/page_supportser/sub_itfund/

Problem statement: The I&T Fund was set up to address several problems. First, technology products often require significant capital and maintenance costs that service providers, often NGOs or small-scale operators, are unable to afford. Second, Hong Kong faces a serious manpower shortage of front-line care workers for older persons, which is in part caused by the immense work pressure associated with the industry. Technology can help reduce the workload of care workers.

Policy statement: The HKSAR Government earmarked HKD 1 billion (USD129 million) to establish the I&T Fund.¹²⁹ The primary objective of the fund is to enable residential care services, community care services and day rehabilitation centers for older persons to procure or rent ageing-related technology products.¹³⁰ Organizations can also use the fund to subsidize trial use of newly developed technology products.¹³¹ The subsidy covers the cost of staff training on how to use technology products and the cost of warranty and maintenance for a maximum of five years.¹³²

HKCSS consulted various stakeholders to draw up a reference list of recognized technology products.¹³³ For products not on the reference list, the assessment panel will conduct assessment on a case-by-case basis. Applications are assessed based on the feasibility, sustainability and cost-effectiveness of products, the benefits brought by products to older persons and whether the applicant organizations have the experience, ability and professional knowledge to apply the products.¹³⁴

- 129 The Government of the Hong Kong Special Administrative Region Press Releases (2018). *Innovation and Technology Fund for Application in Elderly and Rehabilitation Care to open for application next month*. Available at <https://www.info.gov.hk/gia/general/201811/22/P2018112200409.htm>
- 130 Social Welfare Department (2020). *Guidance Notes on Completing "Innovation and Technology Fund for Application in Elderly and Rehabilitation Care" (I&T Fund) Application Form*. Available at https://www.swd.gov.hk/storage/asset/section/3229/en/Guidance_note_for_procurement_and_rental_2020.04.02.docx
- 131 Social Welfare Department (n.d.). *Guidance Notes on Completing "Innovation and Technology Fund for Application in Elderly and Rehabilitation Care" (I&T Fund) Application Form (Trial Use of Newly Developed Technology Product)*. Available at [https://www.swd.gov.hk/storage/asset/section/3229/en/I&T_Fund_application_form_-_Guidance_notes_\(Trial_Use\).docx](https://www.swd.gov.hk/storage/asset/section/3229/en/I&T_Fund_application_form_-_Guidance_notes_(Trial_Use).docx)
- 132 Social Welfare Department (2020). *Innovation and Technology Fund for Application in Elderly and Rehabilitation Care Manual*. Available at https://www.swd.gov.hk/storage/asset/section/3229/en/I&T_Fund_Manual_Aug_2020.pdf
- 133 Social Welfare Department (2020). *"Innovation and Technology Fund for Application in Elderly and Rehabilitation Care" (I&T Fund) Reference list of "Recognised Technology Application Products" (Reference list)*. Available at [https://www.swd.gov.hk/storage/asset/section/3229/en/Updated_Reference_List_\(Aug_2020\).pdf](https://www.swd.gov.hk/storage/asset/section/3229/en/Updated_Reference_List_(Aug_2020).pdf)
- 134 Social Welfare Department (2020). *Innovation and Technology Fund for Application in Elderly and Rehabilitation Care Manual*. Available at https://www.swd.gov.hk/storage/asset/section/3229/en/I&T_Fund_Manual_Aug_2020.pdf

Impact statement: After three rounds of applications throughout 2018 to 2020, the I&T Fund has disbursed more than HKD 200 million (USD 25.8 million) to subsidize 970 elderly and rehabilitation service units to procure or rent more than 4,200 technology products.¹³⁵ 66% of the reimbursement went to elderly service units.¹³⁶

Key takeaways: The I&T Fund exemplifies how governments can effectively use their fiscal power to promote a widespread adoption of technology products to support older persons in care facilities. The subsidy can be further extended to cover older persons living at home rather than in service units. Moreover, since the I&T Fund is a one-off grant that will be progressively disbursed within five years,¹³⁷ more long-term and sustainable fiscal policies should be considered.

Another way that governments can encourage domestic adoption of technology for active ageing is by allocating subsidies to businesses and users.

Provincial funding initiatives in Shandong and Guangzhou provinces in China are good examples.

Case Study 11: Subsidies to Tech Companies and Users (China)

Department: Central Government and Shandong Government and Department of Civil Affairs of Guangdong Province

Dates: 2019 – present (Shandong); 2017 – present (Guangzhou)

Brief description: The Chinese Government has given subsidies to various technology companies at the provincial level to enable faster and cheaper implementation of technology for active ageing devices.

Problem statement: Historically, China has had a culture of children taking care of parents after retirement. However, with more young people migrating into cities for jobs, more older people live alone and need access to care that is not provided by families. Meanwhile, many older persons have difficulty affording technology for active ageing devices.

¹³⁵ The Government of the Hong Kong Special Administrative Region Press Releases (2018). LCQ15 *The use of gerontechnological products by elderly service units*. Available at <https://www.info.gov.hk/gia/general/201801/24/P2018012400758.htm?fontSize=1>

¹³⁶ Ibid.

¹³⁷ Social Welfare Department (2020). Paragraph 1.1.12 of *Innovation and Technology Fund for Application in Elderly and Rehabilitation Care Manual*. Available at https://www.swd.gov.hk/storage/asset/section/3229/en/I&T_Fund_Manual_Aug_2020.pdf https://www.swd.gov.hk/storage/asset/section/3229/en/I&T_Fund_Manual_Aug_2020.pdf

Policy statement: The Chinese Government has provided specific product subsidies, either directly to companies or directly to citizens. In Shandong, the Central and Shandong Provincial Governments spent RMB 22 million (USD 3.14 million) and RMB 3 million (USD 0.46 million) respectively to provide the technology company “Lanchuang” with subsidies for it to rent out its aged care system to older persons for only one RMB (USD 0.16) a day. The aged care system includes a setup box, a webcam paired with a TV set and “Xiaoyi”, a Siri-like voice assistant device. Among various functions, customers gain access to telemedicine and an SOS system through the assistant device, which also includes a video camera so that family members can check in on them (Figure 3.6).¹³⁸

Figure 3.6 Aged care system by Lanchuang



Source Reuters (2019).¹³⁹

Figure 3.7 Ping An Tong



Source Department of Civil Affairs of Guangdong Province (2017).¹⁴⁰

In Guangzhou, the government provides subsidies to citizens who use the app Ping An Tong. Ping An Tong used to be a watch with three virtual buttons as part of a simple user interface, which eventually became a smartphone app in 2017 (Figure 3.7).¹⁴¹ The app allows users to set reminders for taking medication, provides location tracking in case they get lost and has an emergency hotline. For the targeted users, the subsidy provided by the government includes a subsidy of up to 70% for the first year of usage and after a year, the service is 100% funded by the government.¹⁴²

- 138 Woo, Ryan (2019). *Smart home tech makes inroads into China's emerging elderly care market*. Reuters. Available at <https://www.reuters.com/article/us-china-healthcare-elderly-tech-insight/smart-home-tech-makes-inroads-into-chinas-emerging-elderly-care-market-idUSKCN1UY2VS>
- 139 Ibid.
- 140 Yangcheng Evening News (2017). 广州市全面升级“平安通”服务：从“一键呼援”到全方位守护. Available at http://mzj.gz.gov.cn/pglh/lhtzgg/content/post_5616085.html
- 141 Ibid.
- 142 搜狐焦点惠州 (2019). 广州“平安通”为逾10万用户提供定位服务. Available at https://www.sohu.com/a/333109270_701446

Impact statement: Both subsidy schemes have been successful. The Lanchuang app in Shandong has 220,000 older persons signed up.¹⁴³ The Guangzhou Ping An Tong app has had 100,000 users signed up, receiving more than 800 emergency calls.¹⁴⁴ Both figures show good participation, especially given they were only introduced to the market in recent years.

The product subsidies have also allowed more data to be collected and analyzed by the government and private companies. The big data can help governments formulate better policies and help companies create better products.

Key takeaways: Government subsidies for private companies and users can accelerate the adoption of technology for active ageing. Making technology affordable and accessible does not only help older persons but also companies and governments. This is especially true given the recent trend of the heavy utilization of big data and the value companies and governments place into it.

Rental subsidies delineate another method of impactful government intervention, particularly at the individual level. As opposed to permanent procurement of technology products, rental options enable older persons to access ageing-related technologies at a fraction of original price. It also provides flexibility to change products according to

changing health conditions. The direct funding allows older persons to rent the most suitable technology for their individual needs rather than limiting their selection to generalized assistive devices employed by service providers. An example of such a policy is the Welfare Equipment Rental Program in Japan.

143 Woo, Ryan (2019). *Smart home tech makes inroads into China's emerging elderly care market*. Reuters. Available at <https://www.reuters.com/article/us-china-healthcare-elderly-tech-insight/smart-home-tech-makes-inroads-into-chinas-emerging-elderly-care-market-idUSKCN1UY2VS>

144 搜狐焦点惠州 (2019). 广州“平安通”为逾10万用户提供定位服务. Available at https://www.sohu.com/a/333109270_701446

Case Study 12: Welfare Equipment Rental Program (Japan)

Department: Health and Welfare Bureau for the Elderly and Ministry of Health, Labor and Welfare¹⁴⁵

Key Collaborator: The Association for Technical Aids (ATA), an NGO focused on welfare equipment.¹⁴⁶

Date: 2000 – present

Brief description: The Welfare Equipment Rental Program (WERP) is a part of the Long-Term Care Insurance Act, allowing older persons to rent assistive devices for a fraction of market value.¹⁴⁷

Problem statement: The WERP addresses the high cost of assistive devices. A care robot can cost around JPY 400,000 (USD 3,800),¹⁴⁸ with simpler technologies such as a powered wheelchair still costing JPY 370,000 (USD 3,500).¹⁴⁹ This means that the widespread adoption of such technologies would be difficult due to financial accessibility issues.

Policy statement: The WERP enables older persons to rent age-related technologies under the Long-Term Care Insurance Act, the mandatory nationwide insurance system for all Japanese above the age of 65.¹⁵⁰ Older persons rent assistive devices for either 10% or 20% of the original price, depending on the beneficiary's income.¹⁵¹ Implementation of WERP is assisted by the Association for Technical Aids (ATA), an NGO focused on welfare equipment.¹⁵² ATA runs a training program that trains specialist assistive device planners to develop individualized assistive device use plans for beneficiaries' rented devices.¹⁵³

145 Health and Welfare Bureau for the Elderly and Ministry of Health, Labour and Welfare (2016). *Long-Term Care Insurance System of Japan*. Available at https://www.mhlw.go.jp/english/policy/care-welfare/care-welfare-elderly/dl/lcjsj_e.pdf

146 Crume, Yoko (2018). *Assistive Device Revolution for the Independence of Older Adults in Japan Care Robots and Other Technology Innovations*. International Longevity Center Japan. Available at http://www.ilcjournal.org/studyE/doc/2018_1.pdf

147 Ibid.

148 Lee, Don (2019). *Desperate for workers, aging Japan turns to robots for healthcare*. LA Times. Available at <https://www.latimes.com/world-nation/story/2019-07-25/desperate-for-workers-aging-japan-turns-to-robots-for-healthcare>

149 The Japan Times (2019). *Firms promote electric wheelchairs as more Japanese turn in their driving permits*. Available at <https://www.japantimes.co.jp/news/2019/09/17/national/firms-promote-electric-wheelchairs-japanese-turn-driving-permits/>

150 Crume, Yoko (2018). *Assistive Device Revolution for the Independence of Older Adults in Japan Care Robots and Other Technology Innovations*. International Longevity Center Japan. Available at http://www.ilcjournal.org/studyE/doc/2018_1.pdf http://www.ilcjournal.org/studyE/doc/2018_1.pdf

151 Ibid.

152 Ibid.

153 Ibid.

The products are provided by external private companies participating in the program. Products available under WERP must have a warranty during the rental period. They are categorized into 13 categories based on functionality (e.g., wheelchairs, walkers, hospital beds) for easier rental choice and customization.¹⁵⁴ Once rented, users can exchange devices with the participating company if their health condition changes such that they require a different device.¹⁵⁵

Impact statement: Taking the assistive products company France Bed's rental services as an example, the market size of the rental service in 2015 was JPY 280 billion (USD 2.5 billion), offered in more than 7,000 service offices.¹⁵⁶ In the same year, 800,000 sets of nursing beds and 650,000 sets of wheelchairs, have been subsidized for rental for 33 million insured individuals in 2015.¹⁵⁷ Across Japan, roughly 13,200 assistive device planners have been trained to give advice and consultations for plans of action.¹⁵⁸

Since rented devices can be tailored with the help of a trained professional to each person's needs, it allows older persons to quickly adapt to innovative technologies. Rented devices can help housing units become accessible and give older persons the opportunity to live at home for longer. WERP not only allows for more user to have access to these devices, but also promotes less waste as devices can be exchanged whenever someone's health condition changes.

Key takeaways: WERP was the first program worldwide to test out the rental market of technology for active ageing. Its enormous success proves its viability and the strong demand and supply by older persons and private companies. A particular concern is that currently, WERP does not offer individual rentals to beneficiaries living in residential facilities. Instead, the facilities have to purchase a lump sum from the companies and rent them out to residents.¹⁵⁹

154 Ibid.

155 Equipment is shipped from warehouses of these companies following a consultation with a specialist planner and are returned to the warehouse where devices are cleaned, repaired and reused following the rental period. Available at [http://webcontent.hkcss.org.hk/irn/events1819/10.%20\(ELD\)HCR/Japan_ReportBackSession_Final.pdf](http://webcontent.hkcss.org.hk/irn/events1819/10.%20(ELD)HCR/Japan_ReportBackSession_Final.pdf)

156 Hong Kong Council of Social Services (2019). *Japan Report Back Session*. Available at [http://webcontent.hkcss.org.hk/irn/events1819/10.%20\(ELD\)HCR/Japan_ReportBackSession_Final.pdf](http://webcontent.hkcss.org.hk/irn/events1819/10.%20(ELD)HCR/Japan_ReportBackSession_Final.pdf)

157 Ibid, p10; Health and Welfare Bureau for the Elderly, Ministry of Health, Labour and Welfare (2016). *Long-Term Care Insurance System of Japan*. Available at https://www.mhlw.go.jp/english/policy/care-welfare/care-welfare-elderly/dl/tcisj_e.pdf

158 Crume, Yoko (2018). *Assistive Device Revolution for the Independence of Older Adults in Japan Care Robots and Other Technology Innovations*. International Longevity Center Japan. Available at http://www.ilc-japan.org/studyE/doc/2018_1.pdf http://www.ilc-japan.org/studyE/doc/2018_1.pdf

159 Ibid.

Community-based initiatives

Public procurement of technology products represents an alternative route of adoption to tangibly increase technology application among older persons. Integrating technologies directly into the lives of older persons ensures a definitive introduction to helpful technology for active ageing. The Community

Care Program in the Republic of Korea employed a multipronged strategy that incorporated ageing-related technologies into both new and existing senior residences. The wide scope of the policy directly integrated technologies into the lives of hundreds of thousands of older persons.

Case Study 13: Community Care Program (Republic of Korea)

Department: Ministry of Health and Welfare (MOHW)¹⁶⁰

Date: 2019 – present

Brief description: The Community Care Program provides a comprehensive care system of residential, medical and nursing services directly in the homes and neighborhoods of older persons by leveraging ageing-related technologies.¹⁶¹

Problem statement: A study revealed that 58% of older persons would prefer to live in their homes rather than care institutions.¹⁶² However, many homes are inadequately equipped to suit the needs of older persons. For example, over KRW 1.3 trillion (USD 1 billion) is spent on treating accidental fractures among older persons every year,¹⁶³ when such accidents could be easily avoided with simple technologies like anti-slip mats.

¹⁶⁰ Hwang Ye-rang and Park Hyun-jung (2018). *Comprehensive community care system to allow elderly Koreans to live in their homes by 2025*. Hankyoreh. Available at http://english.hani.co.kr/arti/english_edition/e_national/871188.html; Lee, TaeBum (2013). *Community-Based Home Healthcare Project for Korean Older Adults*. *Osong Public Health and Research Perspectives*, 4(5), 233-239.

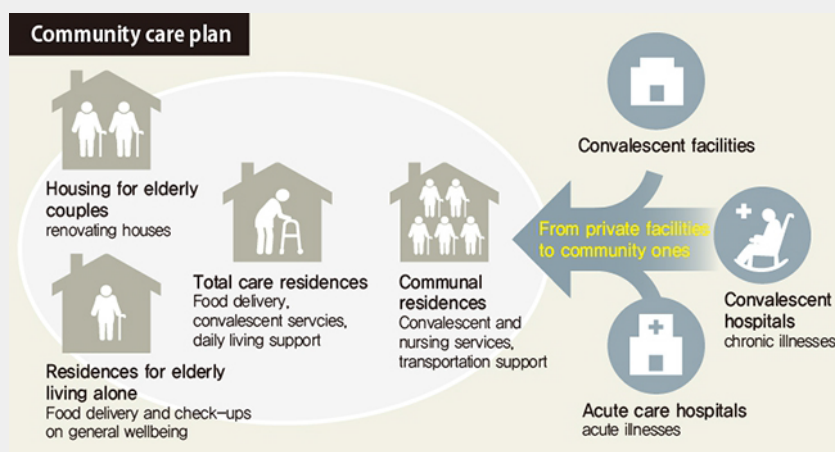
¹⁶¹ Hwang Ye-rang and Park Hyun-jung (2018). *Comprehensive community care system to allow elderly Koreans to live in their homes by 2025*. Hankyoreh. Available at http://english.hani.co.kr/arti/english_edition/e_national/871188.html

¹⁶² SilverEco International Portal (2018). *S. Korea is taking steps to improve care and support for seniors living at home*. Available at <http://www.silvereco.org/en/s-korea-is-taking-steps-to-improve-care-and-support-for-seniors-living-at-home/>

¹⁶³ Hwang Ye-rang and Park Hyun-jung (2018). *Comprehensive community care system to allow elderly Koreans to live in their homes by 2025*. Hankyoreh. Available at http://english.hani.co.kr/arti/english_edition/e_national/871188.html

Policy statement: In 2019, the Republic of Korea’s Ministry of Health and Welfare established a six-year comprehensive community care plan. KRW 8 billion (USD 6.7 million) was allocated to enable older persons and persons with disabilities to enjoy customized services without leaving their homes and to continue engaging with their communities. Services range from core medical, nursing and care services to leisure and welfare services, such as hair styling and exercise programs.¹⁶⁴

Figure 3.8 Community Care Plan “From private facilities to community ones”¹⁶⁵



Source Hwang Ye-rang and Park Hyun-jung (2018).

Integration of technology services into various facets of care is an encompassing objective across the program’s initiatives. To provide older persons with living alternatives beyond institutional facilities, the framework encourages the creation of safe and comfortable living spaces with the assistance of technology. The ROK Government funded KRW 600 million (USD 500,000) to launch two-year trial programs in 12 local government bodies.¹⁶⁶ 40,000 units of subsidized public housing are estimated to be completed by 2022 across the various municipalities with 5,000 units reserved for low-income seniors who live alone.¹⁶⁷ The units are equipped to leverage simple technology, such as preinstalled motion sensors and automatic gas cutoffs, to address common safety concerns for older persons. Local governments are also designated to lead renovation efforts in existing senior homes by installing various safety-enhancing technologies.

164 Ibid.

165 Ibid.

166 Ibid.

167 Ibid.

Impact statement: The Community Care Program has empowered older persons to continue living independently through the strategic placement of technology embedded housing units near health facilities. Older persons benefit not only from the geographic proximity to medical establishments, but also from the flexibility to access various forms of medical attention. Health visitation services connecting nurses to older persons with chronic diseases and those who live alone have been provided to 1.1 million households.¹⁶⁸ Personalized medical visits are complemented by the installation of safety devices to ensure tenants' safety, even in the absence of medical professionals.

The policy attention to technological solutions has also demonstrated the need to implement impactful yet straightforward residential technology. For example, renovation initiatives under the Community Care Program have equipped 270,000 senior homes with motion sensors and safety handrails.¹⁶⁹ Modest technological improvements to bathrooms have effectively resolved a pervasive and grave threat to the older community. As a result, the Community Care Program has established a robust foundation for future initiatives to build upon and justified the need for greater funding in residential technology products for older persons.

Key takeaways: The Community Care Program has yielded notable results across both public and private senior residences. Direct public procurement of ageing-related technologies to install in pre-equipped homes is critical in facilitating broader adoption of technology products among older persons. To create more significant impacts, basic technologies such as non-slip mats and safety handrails can be expanded to include other more advanced products, such as automatic gas cutoff features.

In addition to integrating technology for active ageing into specific community spaces such as public housing, technology could be leveraged to enhance and optimize the delivery of ageing-related services within a community. This is what the Wuzhen "Internet + Elderly Care" Service Platform does. Through the

use of various smart devices, the platform uploads data about older persons onto an information service platform that is accessible to multiple service providers, enabling more efficient provision of tailored offline services to end-users within the community.

¹⁶⁸ Ibid.

¹⁶⁹ Ibid.

Case Study 14: Wuzhen “Internet + Elderly Care” Service Platform (China)

Department: Wuzhen Municipal Government of Tongxiang County, Jiaxing City, Zhejiang Province

Key Collaborator: Chunxitang Social Service Development Center for the Elderly (‘Chunxitang’), an NGO providing services to older persons owned by Shanghai Chunqiji Investment Management Co., Ltd.¹⁷⁰

Date: 2015 – present

Brief description: The Wuzhen “Internet + Elderly Care” Service Platform is an integrated online-offline platform that uses smart devices to collect user data onto an information service platform, which enables efficient provision of tailored offline services to end-users.

Problem statement: The population of Wuzhen is ageing rapidly which led to an increased demand for welfare services.¹⁷¹ Moreover, over 90% of older persons in Wuzhen are reported as choosing to live at home.¹⁷² There is therefore a need to maximize the efficiency of existing services.

Policy statement: In 2015, Wuzhen was the first Chinese municipality to launch an “Internet + Elderly care” platform.¹⁷³ The platform is a public-private partnership between the Wuzhen Municipal Government and Chunxitang, an NGO providing services to older persons. The Wuzhen Municipal Government provides funds, supervision, human resource training and policy support, while Chunxitang carries out operations and management functions.¹⁷⁴

The platform combines online and offline presences to optimize service delivery. The “online” element is an information management platform that uses smart devices to collect user data onto a cloud computing service for remote monitoring and management. Smart home devices include emergency alarms, infrared

170 Kangmei (2016). 椿熙堂老年社会服务发展中心总经理韩纪江到康美健康云调研. Available at <http://www.kangmei.com.cn/index.php?m=content&c=index&a=show&catid=27&id=1393>

171 冯桂平, 谢雨红 and 刘文静 (2019). 服务链视角下的浙江省桐乡市乌镇智能居家养老服务模式. 中国老年学杂志 2019 年 7 月第 39 卷.

172 王曉鈴 (2019). 黑科技展神威 烏鎮養老「嚇嚇叫」. 旺旺中時媒體集團. Available at <https://turnnewsapp.com/global/health/141298.html>

173 浙江实践 (n.d.). 浙江乌镇“互联网+养老服务”椿熙堂模式“三基法”. 36-37.

174 冯桂平, 谢雨红 and 刘文静 (2019). 服务链视角下的浙江省桐乡市乌镇智能居家养老服务模式. 中国老年学杂志 2019 年 7 月第 39 卷.

unmanned sensors, door sensors, etc. Older persons can also rent a SOS bracelet for one RMB (USD 0.16) per day. Once older persons press the emergency help button, a staff member will come to their physical location.¹⁷⁵

The “offline” element consists of physically staffed Wuzhen Home Care Service Center that provides older persons with meals, fitness activities, recreational activities, bathing assistance, etc.¹⁷⁶ User data is fed into affiliated social organizations such as care homes, NGO service providers, medical institutions and research institutions. The various organizations then analyze the data to provide better tailored services to older persons and offer scientific-based policy recommendations for the government.¹⁷⁷

Impact statement: In 2017, Wuzhen was selected as a national demonstration zone (township) for smart health and aged care. As of 2019, more than 144,000 community-based care services, 19,000 door-to-door services and 43 emergency rescue services have been provided to older persons in Wuzhen. 72,000 pieces of unique data collected by smart safety monitoring devices have helped enable these results.¹⁷⁸

The platform has successfully shortened the service response cycle, facilitated service request channels, improved transparency between services providers and reduced costs and burdens on front-line caregivers. Through the platform, data about the needs of older persons is collected, analyzed and transformed into an easily identifiable demand flow for service providers and other social-medical organizations.¹⁷⁹

Key takeaways: While many policies focus on subsidies to procure technology for active ageing, Wuzhen’s platform demonstrates how technology can also optimize existing service delivery. This platform is an effective municipal-level model that connects older persons to local service providers, without advanced research capabilities or technological infrastructures. This model of operations has the potential to scale up and apply to other cities.

175 王曉鈴 (2019). 黑科技展神威 烏鎮養老「嚇嚇叫」. 旺旺中時媒體集團. Available at <https://turnnewsapp.com/global/health/141298.html>

176 Ibid.

177 冯桂平, 谢雨红 and 刘文静 (2019). 服务链视角下的浙江省桐乡市乌镇智能居家养老服务模式. 中国老年学杂志 2019 年 7 月第 39 卷.

178 Ibid.

179 Ibid.

Labeling initiatives

Lastly, policies that set clear requirements are another way that governments can foster a vibrant technology for active ageing market. Purposefully cultivating environments that are cognizant of ageing challenges can enable older persons to access relevant products

more easily, as well as encourage businesses to cater to older persons. For example, Japan's Smile Care Food labeling system assists with the distribution of nursing care foods. Its success demonstrates how universally recognized labeling can benefit producers, consumers and medical practitioners.

Case Study 15: Smile Care Food (Japan)

Department: Ministry of Agriculture, Forestry and Fisheries (MAFF)

Date: 2013 – present

Brief description: Smile Care Food is a labeling system by the MAFF that classifies nursing care food products according to their nutritional value and ease of chewing or swallowing.¹⁸⁰

Problem statement: A 2012 study suggested that 37% of older persons living independently were categorized as being undernourished and another 35% were at risk of undernutrition.¹⁸¹ The study also found that 50% of home care patients aged 65 and above had problems swallowing,¹⁸² whereas 30% had problems chewing.¹⁸³ While certain nursing care food products can address these health issues, a 2014 study found that although 68% of older persons knew about nursing care food, only 33% had actually used them.¹⁸⁴ This shows that the problem lies beyond the awareness for nursing care food but in the consumption of these products.

Policy statement: There are many types of nursing care food products for older persons in Japan. Many of these products are technologically enhanced with their texture modified for easier swallowing. These food products typically require advanced technology to modify their texture from a chopped, minced, or

¹⁸⁰ Ministry of Agriculture, Forestry and Fisheries (n.d.). スマイルケア食 (新しい介護食品). Available at <https://www.maff.go.jp/j/shokusan/seizo/kaigo.html>

¹⁸¹ Ministry of Agriculture, Forestry and Fisheries (2016). *Efforts Relating to "Smile Care Food" Introduction of New Mark System*. Available at https://www.maff.go.jp/e/policies/food_ind/attach/pdf/index-9.pdf

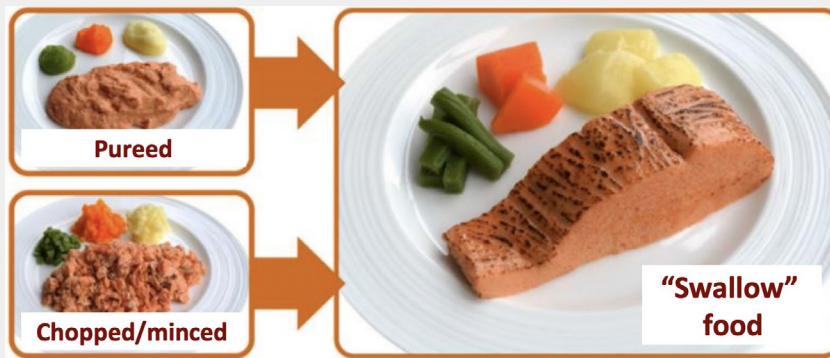
¹⁸² Ibid.

¹⁸³ Ibid.

¹⁸⁴ Ibid.

pureed stage into a form which looks and tastes like the original food product. Figure 3.9 illustrates the transformation of salmon and vegetables.

Figure 3.9 Transformation from pureed and chopped/minced food to texture-modified food¹⁸⁵



Source Modified from Nutri Co.(2018).¹⁸⁶

The Smile Care Food labeling system assists distribution of nursing care food products. Older persons who require medical treatment for nutritional deficiencies or chewing and swallowing difficulties can easily identify the food products required for their respective health conditions.¹⁸⁷ The labeling system consists of blue, yellow and red labels that are stuck onto different nursing care food products. Blue is for those who have no problem with chewing or swallowing but have the need for additional nutritional boosts. Yellow is for those with problem chewing and red is for those with problem swallowing. Both yellow and red labels have detailed sub-categories that differentiate between the degree to which customers are able to chew or swallow respectively.¹⁸⁸

Impact statement: As of 2020, 168 products from 37 companies are permitted to use the blue label¹⁸⁹ and 4 products from 1 company are permitted to use the yellow label.¹⁹⁰ As of 2019, 13 products from 1 company are

¹⁸⁵ "Swallow food" is a direct translation from the Japanese "嚥下食" in the original graphic

¹⁸⁶ Suzuki, Naomi (2018). *Sophisticated "Engay Food" Easy to swallow food from Japan that looks and tastes like the real thing*. Nutri Co., Ltd. Available at <https://www.healthyeingsummit-asiapacific.com/wp-content/uploads/2018/06/2.Naomi-Suzuki.pdf>

¹⁸⁷ Ministry of Agriculture, Forestry and Fisheries (2018). スマイルケア食海外展開プロジェクト実行計画. Available at <https://www.maff.go.jp/j/shokusan/seizo/attach/pdf/kaigo-62.pdf>

¹⁸⁸ Ministry of Agriculture, Forestry and Fisheries (2016). *Efforts Relating to "Smile Care Food" Introduction of New Mark System*. Available at https://www.maff.go.jp/e/policies/food_ind/attach/pdf/index-9.pdf

¹⁸⁹ Ministry of Agriculture, Forestry and Fisheries (2020). スマイルケア食「青」マーク利用特約企業・商品. Available at <https://www.maff.go.jp/j/shokusan/seizo/attach/pdf/kaigo-79.pdf>

¹⁹⁰ Ministry of Agriculture, Forestry and Fisheries (2019). スマイルケア食「黄」マーク利用特約企業・商品. Available at <https://www.maff.go.jp/j/shokusan/seizo/attach/pdf/kaigo-77.pdf>

permitted to use the red label.¹⁹¹ The labeling scheme allows easy communication by medical practitioners when prescribing dietary treatment plans. For example, a doctor, dentist, or dietitian can advise discharged patients to select products with the specific label and number, thereby ensuring patients to have purchased the right food product.¹⁹²

Smile Care Food labeling scheme has also helped facilitate the growth of the Japanese nursing care food market.¹⁹³ Soft meals help relieve the effort of cooking by older persons and caregivers, while nutritional supplements help prevent frailty and loss of muscle mass.¹⁹⁴ Exports of Japanese nursing care foods across Asia have earned success and the MAFF has further released a plan in 2018 for overseas expansion of the Smile Care Food labeling system to Singapore, Thailand and other countries.¹⁹⁵

Key takeaways: The Smile Care Food labeling system shows how clear and regulated labeling facilitates the distribution process of technology for active ageing product between consumers, producers and medical practitioners. More could be done to improve the system, for example by increasing the number of products under each label.

191 Ministry of Agriculture, Forestry and Fisheries (2019). スマイルケア食「赤」マーク利用許諾企業・商品. Available at <https://www.maff.go.jp/j/shokusan/seizo/attach/pdf/kaigo-66.pdf>

192 Ministry of Agriculture, Forestry and Fisheries (2018). スマイルケア食海外展開プロジェクト実行計画. Available at <https://www.maff.go.jp/j/shokusan/seizo/attach/pdf/kaigo-62.pdf>

193 The nutritional supplement nursing care food market grew from JPY 8.2 billion in 2010 to JPY 21.1 billion in 2019, with a forecast of JPY 35 billion in 2025. Meanwhile, the market for easy to chew and swallow nursing care foods grew from JPY 8.8 billion in 2010 to JPY 19.6 billion in 2019, with a forecast of JPY 28 billion in 2025. Available at <https://www.maff.go.jp/j/shokusan/seizo/attach/pdf/kaigo-74.pdf> and https://release.nikkei.co.jp/attach_file/0529456_01.pdf

194 Fuji Keizi Group (2019). <調査結果の概要>, 高齢者向け食品市場の将来展望 2019. Available at https://release.nikkei.co.jp/attach_file/0529456_01.pdf

195 Ministry of Agriculture, Forestry and Fisheries (2018). スマイルケア食海外展開プロジェクト実行計画. Available at <https://www.maff.go.jp/j/shokusan/seizo/attach/pdf/kaigo-62.pdf>



Chapter III. Creating Enabling Policy Frameworks for Gerontechnology

Leveraging Technology for the Madrid International Plan of Action on Ageing; Experiences of China, Japan and the Republic of Korea

STRENGTHENING REGIONAL COLLABORATION ON TECHNOLOGY FOR ACTIVE AGEING

Awareness 

Organize regional technology for active ageing exhibitions and demonstration zones

Accessibility 

Create a knowledge hub on digital and physical accessibility guidelines



1. PREREQUISITE STAGE

4. ADOPTION STAGE

2. RESEARCH STAGE

3. PRODUCT DEVELOPMENT STAGE

Distribution 

Establish mutual recognition agreements for relevant industrial standards

User budgetary constraints 

Leverage foreign aid initiatives to enable adoption of technology for active ageing

Funding 

Establish a research fund for targeted collaborative projects

Capacity Building 

- Strengthen regional academic collaboration
- Launch regional technology for active ageing competitions

Data 

- Develop a regional database with healthcare-related analytical results
- Collect and disseminate technology for active ageing market information and data

Scaling 

Provide funding and mentorship for start-up incubation and acceleration

Testbeds 

Create a regional testbed collaboration network

Chapter IV.

Strengthening Regional Collaboration on Technology for Active Ageing



Sharing knowledge and good practices on technology for active ageing are mutually beneficial for countries to address the common

challenges of population ageing within and beyond North-East Asia. Based on the experiences of China, Japan and the Republic of Korea, Chapters II and III provide references to support countries in customizing the use of technology for active ageing as well as creating enabling policy frameworks for the development of technology for ageing societies according to national contexts.

Apart from national efforts, to effectively implement the MIPAA in Asia and the Pacific, **stronger (sub) regional collaboration is needed to fully utilize technology to prepare for rapid population ageing.** Indeed, the key role of STI in the implementation of the MIPAA and the achievement of the 2030 Agenda for Sustainable Development, as well as the significance of international cooperation in this regard have been reiterated in different intergovernmental meetings.¹⁹⁶

The COVID-19 pandemic is a reminder of the import-

ance of global solidarity and collaboration. While the development of vaccines usually takes several years, various vaccines were created in less than a year with the help of collaborative platforms and mechanisms. Building on this spirit, countries are advised to enhance (sub)regional collaboration to create synergies and leverage technology to accelerate the implementation of the MIPAA.

Overarching Recommendation

To fully leverage technology to support older persons, countries are recommended to strengthen (sub)regional cooperation on technology for active ageing.¹⁹⁷

(Sub)regional collaborative mechanisms on technology for active ageing could be further institutionalized under an intergovernmental cooperation framework. For instance, in North-East Asia, the Tripartite Health Ministers Meeting (THMM) between China, Japan and the Republic of Korea was inaugurated in 2007 to discuss various areas of cooperation. Active and healthy ageing was one of the three main agenda of the 12th THMM in December

¹⁹⁶ For example, Declaration on the commemoration of the seventy-fifth anniversary of the United Nations (<https://undocs.org/pdf?symbol=en/A/RES/75/1>), 72nd Session of the Economic and Social Commission for Asia and the Pacific (https://www.unescap.org/sites/default/files/E72_RES12E.pdf) and the Asia-Pacific Intergovernmental Meeting on the Third Review and Appraisal of the Madrid International Plan of Action on Ageing (https://www.unescap.org/sites/default/files/AgeingMeetingReport_DEC18.pdf).

¹⁹⁷ The two cross-cutting considerations (i.e., direct stakeholder engagement and diversity, equity and inclusion) stressed in ESCAP's publication "Using Information Communication Technologies to Address the Health Care Needs of Older Persons Managing Chronic Disease: A Guidebook and Best Practices from Asia and the Pacific" are important principles in the formulation of national policy as well as (sub)regional cooperation, ensuring that the benefits of technology are evenly spread across societies.

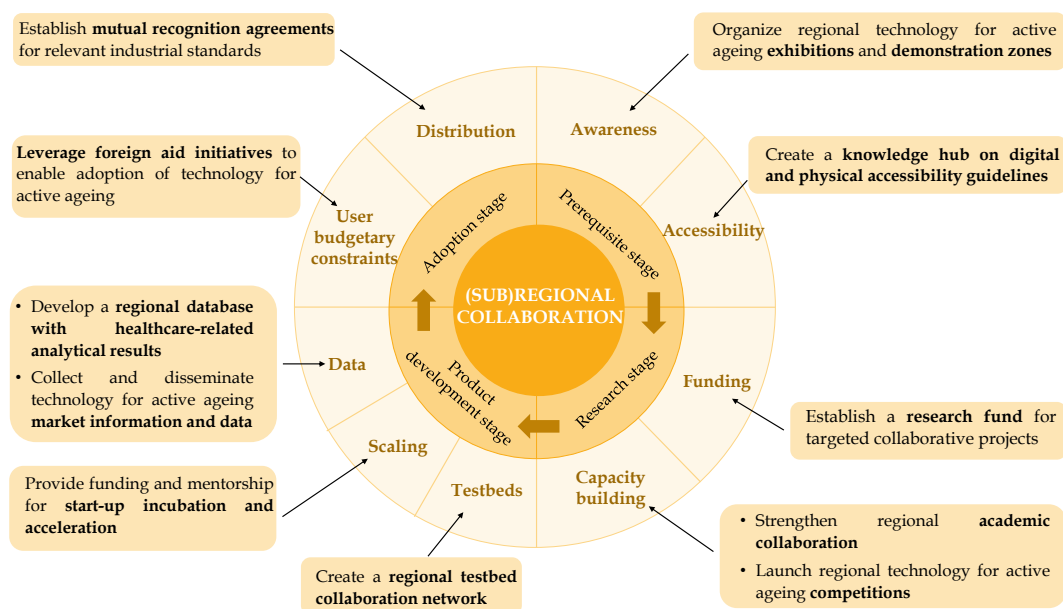
2019, where vigorous exchange on the utilization of ICT in national health insurance system took place.

¹⁹⁸ In addition, the three countries have collaborated through the Association of Southeast Asian Nations (ASEAN) Plus Three. The ASEAN Plus Three (APT) Cooperation Work Plan 2018-2022 outlines different areas of cooperation, including active ageing and STI.¹⁹⁹ Building on existing mechanisms, cooperation could be broadened to a wider regional level with technology for active ageing included as one of the priority areas.²⁰⁰

Potential Initiatives for (Sub)regional Collaboration

Having described the overarching recommendation, the rest of the Chapter will provide detailed suggestions on the potential areas of (sub)regional collaboration. Riding on the existing efforts, stronger (sub)regional collaboration could create synergy to leverage technological solutions to support older persons. Figure 4.1 summarizes some potential initiatives structured around the four key stages of the technology for active ageing ecosystem and sub-

Figure 4.1 Summary of potential initiatives for (sub)regional collaboration



¹⁹⁸ Trilateral Cooperation Secretariat (2019). *12th Tripartite Health Ministers' Meeting*. Available at https://tcs-asia.org/en/board/news_view.php?idx=3307. Meanwhile, the Joint Declaration on Active and Healthy Ageing Cooperation was adopted at the 8th Trilateral Summit in the same month.

¹⁹⁹ In terms of promoting active ageing, cooperation such as sharing information and experiences of the ageing in APT, supporting for ASEAN's effort in developing an ASEAN regional action plan on ageing and promoting collaboration in research and development on elderly health issues identified as priorities by APT countries was mentioned, whereas STI cooperation included exploring joint capacity building activities, exchange of information and sharing of best practices in areas of mutual interest such as STI policies, technology transfer, commercialization, products and scientific standards, investment and intellectual property rights management, as well as promotion of research and technology development in areas with potential for commercial applications. Available at <https://aseanplusthree.asean.org/wp-content/uploads/2020/01/APT-Corp-WorkPlan-2018-2022-Final.pdf>

²⁰⁰ In fact, promotion of health and active ageing is one of the priority areas of ASEAN Post-2015 Health Development Agenda. Available at <https://asean.org/wp-content/uploads/2017/02/APHDA-In-a-Nutshell.pdf>

categories therein as analyzed in Chapter III.

Prerequisite Stage

Awareness: One of the most fundamental and persistent problems within the technology for active ageing ecosystem is the lack of awareness of the existence and importance of these products, as the technology for active ageing industry is relatively new.

Organize regional technology for active ageing exhibitions and demonstration zones

As discussed in Chapter III, the Gerontech and Innovation Expo cum Summit in Hong Kong, China demonstrates how government can effectively leverage on the momentum from large-scale exhibitions to not only raise awareness, but also spur local technology for active ageing ecosystem development. While each country has respective ageing-related exhibitions, such as Elderly Health Industry Expo in China,²⁰¹ Elderly Care & Nursing Expo in Japan,²⁰² and the International Gerontechnology Expo and Forum in the Republic of Korea,²⁰³ **regional exhibitions could be organized to raise awareness of ageing-related technologies from different countries.**

Another example is China's pilot demonstration zones, which have effectively raised awareness on technology

for active ageing in a localized setting. **Cooperative demonstration zones could be organized to display and demonstrate technology for active ageing products from the region.** While not explicit to technology for active ageing, China and the Republic of Korea announced in April 2020 that they will construct an international cooperation demonstration zone in Changchun city, China. The zone will establish multifaceted, open cooperation on various industries, technologies, trade, social studies and environmental protection.²⁰⁴ This model could be a reference for regional cooperative demonstration zones that focus on technology for active ageing.

Accessibility: Older persons experience various kinds of digital and physical accessibility issues. For digital accessibility, older persons with insufficient digital literacy may have difficulty using contemporary technologies, while others with hearing or visual impairments may have difficulty accessing technologies without assistive devices. A further challenge lies in physical accessibility, especially as countries increasingly advocate for 'ageing in place'²⁰⁵ which creates a pressing need for localized point-to-point physical accessibility between older persons' homes and their commonly visited areas in the community. One of the joint efforts to address these issues is web accessibility guidelines which

²⁰¹ Eldexpo (2020). *Exhibition Introduction*. Available at <http://www.eldexpo.com/en/gz/overview>

²⁰² Medical Japan (2020). *Elderly Care & Nursing Care*. Available at <https://www.medical-jpn.jp/en-gb/about/outline/NS.html>

²⁰³ International Gerontechnology Expo & Forum (2018). *International Gerontechnology Expo & Forum*. Available at <http://gerontechnology.kr/gt/>

²⁰⁴ The State Council of the People's Republic of China (2020). *China-ROK cooperation zone to take shape*. Available at http://english.www.gov.cn/policies/latestreleases/202004/27/content_WS5ea68b6cc6d0b3f0e94967e1.html

²⁰⁵ 'Ageing in place' is an ageing policy defined as "remaining living in the community, with some level of independence, rather than in residential care". Available at Wiles, Janine L., Leibing, Annette, Guberman, Nancy, Reeve, Jeanne and Allen, Ruth E.S. (2012). *The Meaning of "Ageing in Place" to Older People*. *The Gerontologist* 52(3), 357-366.

ensure older persons gaining access to technology and relevant content. Meanwhile, improving the accessibility of physical infrastructures could allow the operation of certain technologies for active ageing such as mobility aids and smart wheelchairs. These could improve the adoption of technology for active ageing products.

Create a knowledge hub on digital and physical accessibility guidelines

There are several initiatives to close the digital divide in the region, such as the Asia-Pacific Information Superhighway (AP-IS), an initiative by ESCAP to increase the availability and affordability of broadband Internet across Asia and the Pacific by strengthening the region's underlying Internet infrastructure.²⁰⁶ In addition to these efforts, **a knowledge hub could help improve accessibility of older persons in the region by compiling and disseminating digital and physical accessibility guidelines and relevant resources.** For example, the Web Accessibility Initiative provides a literature review²⁰⁷ analyzing and explaining how existing guidelines relate to older web users.²⁰⁸ Similarly, there are websites²⁰⁹ and academic

literature²¹⁰ explaining how Universal Design Principles – a design framework that makes physical spaces and products benefit the widest possible range of people and solutions – benefit older persons.²¹¹ Where there are gaps between existing digital and physical accessibility guidelines and older persons' accessibility needs, a knowledge hub could develop accessibility guidelines that are more catered to older persons.

Research Stage

Funding: There is limited funding for technology for active ageing research from the public and private sectors in the region. Even where funding exists, there remains an additional challenge of how to strategically use such funds to best advance the region's technology for active ageing research capabilities.

Establish a research fund for targeted collaborative projects

A research fund could be established to provide strategic support for targeted collaborative research projects, to be conducted by various research institutes in the region. At the national

²⁰⁶ The implementation of the Asia-Pacific Information Superhighway Cooperation Master Plan (2019-2022) and Regional Framework Document (2019-2022), as well as effective multi-stakeholder partnerships (e.g., potential joint activities with the Russian Academy of Sciences and the China Academy of Information and Communications Technology), are expected to improve ICT connectivity in North-East Asia as well as in Asia and the Pacific. Available at https://www.unescap.org/sites/default/files/ESCAP_CICTSTI_2018_INF1.pdf, https://www.unescap.org/sites/default/files/ESCAP_CICTSTI_2020_INF2_0.pdf, <https://www.unescap.org/sites/default/files/Evaluation-Report-China-AP-IS-with-MR.pdf>

²⁰⁷ Arch, Andrew (2008). *Web Accessibility for Older Users: A Literature Review*. W3C Web Accessibility Initiative. Available at <https://www.w3.org/TR/wai-age-literature/>

²⁰⁸ Arch, Andrew, Abou-Zahra Shadi (2018). *Developing Websites for Older People: How Web Content Accessibility Guidelines (WCAG) 2.0 Applies*. W3C Web Accessibility Initiative. Available at <https://www.w3.org/WAI/older-users/developing/>

²⁰⁹ AgingCare (2020). *Aging in Place: Using Universal Design to Create a Senior-Friendly Home*. Available at <https://www.agingcare.com/articles/universal-design-for-safety-and-comfort-for-seniors-95677.htm>

²¹⁰ Mustaqim, Moyan M. (2015). *A Study of Universal Design in Everyday Life of Elderly Adults*. *Procedia Computer Science* 67, 57-66.; Harsritanto, Bangun IR (2017). *A Review of Universal Design on Elderly House Designs Development*. *MODUL*, 16(2), 116-120.

²¹¹ It could also include discussions on what to do and what not to do as well as good practices.

level, in addition to the case studies discussed in Chapter III, strategic funding for technology for active ageing is exemplified by Aging Gracefully across Environments using Technology to Support Wellness, Engagement and Long Life (AGE-WELL). AGE-WELL is a comprehensive technology and ageing network in Canada dedicated to creating technologies and services that benefit older persons and caregivers. It facilitates different initiatives that fund, oversee and provide strategic direction for end-user-driven transdisciplinary research, capacity building programs and startup incubation or acceleration related to technology for active ageing.²¹² AGE-WELL's strategic R&D investments are directed into eight challenge areas,²¹³ which were developed at regional universities through extensive review and public consultation of over 1,000 stakeholders.²¹⁴ Similarly, **a regional network could be established to facilitate the identification of strategic focus areas in the region and offer research funds for targeted collaborative research projects.**

To help source funding for such research, **the regional network could leverage existing bilateral and regional research and project funds to build up**

future funding capacities for targeted technology for active ageing research projects. An example of a bilateral technology for active ageing research project is the EU-Japan cooperation on Novel ICT Robotics based solutions for active and healthy ageing at home or in care facilities.²¹⁵ Other international bilateral research funding arrangements include the US-ASEAN Fulbright research program²¹⁶ and ASEAN-EU Dialogue on Science and Technology.²¹⁷ In the region, the Asia-Pacific Economic Cooperation (APEC)²¹⁸ and ASEAN-Korea Cooperation Fund (AKCP)²¹⁹ provide different types of funds for strategic development projects. Given the increasing prevalence of population ageing as a regional issue, the regional network could work with these institutions to extend their existing project funds to include targeted funding for projects related to technology for active ageing.

Capacity building: Given that the technology for active ageing industry is relatively new, a challenge within the region is how to train and develop expertise in the field both within academia and the industry. There is also a challenge of attracting existing and new talents into the industry.

212 AGE-WELL (2021). *About AGE-WELL*. Available at <https://agewell-nce.ca/about-age-well>

213 The eight challenge areas are (1) Supportive Homes & Communities, (2) Health Care & Health Service Delivery, (3) Autonomy & Independence, (4) Cognitive Health & Dementia, (5) Mobility & Transportation, (6) Healthy Lifestyles & Wellness, (7) Staying Connected and (8) Financial Wellness & Employment. Available at <https://agewell-nce.ca/challenge-areas>

214 AGE-WELL (2019). *The Future of Technology and Aging Research in Canada*. Available at https://agewell-nce.ca/wp-content/uploads/2018/05/Booklet_8_Challenges_English_2019oct2_digital.pdf

215 CORDIS (2016). *EU-Japan cooperation on Novel ICT Robotics based solutions for active and healthy ageing at home or in care facilities*. Available at https://cordis.europa.eu/programme/id/H2020_SC1-PM-14-2016

216 U.S. Mission to ASEAN (n.d.). *Fulbright U.S. – ASEAN Programs*. Available at <https://asean.usmission.gov/education-culture/leaders/fulbright-u-s-asean-programs/>

217 European Commission (n.d.). *Southeast Asia*. Available at https://ec.europa.eu/info/research-and-innovation/strategy/international-cooperation/south-east-asia_en#policy-background

218 Asia-Pacific Economic Cooperation (2020). *APEC Project Funding Sources*. Available at <https://www.apec.org/Projects/Funding-Sources>

219 ASEAN-Korea Cooperation Fund (2019). *Our Works*. Available at <https://www.aseanrokfund.com/our-works>

Strengthen regional academic collaboration

In addition to providing strategic funding, it is necessary to strengthen regional academic collaboration. There are already some efforts to facilitate academic studies on technology for active ageing in the region. For example, the third summit of China-Japan smart older persons care industry was successfully held in Renmin University of China in 2019.²²⁰ The Open University of Hong Kong also hosted an International Conference on Gerontechnology in 2020.²²¹

The experience of the Asia-Pacific Research and Training Network on Science, Technology & Innovation Policy (ARTNET on STI Policy) could help inform the development of a regional technology for active ageing network. ARTNET on STI Policy, an initiative of ESCAP, is a knowledge platform which shares findings of academic research on STI and their policy implications for sustainable development in the Asia-Pacific region.²²² In relation to technology for active ageing, one specific policy focus area of ARTNET on STI Policy is inclusive technology and innovation policies, which discusses ways to include

disadvantaged groups such as women, older persons and persons with disabilities into innovation process and ensure that they could benefit from technological advances.²²³ Another example of partnership is the Asia Pacific Observatory on Health Systems and Policies which promotes evidence-based health system policy in the region, involving research institutions, development partners, governments and international agencies.²²⁴

The regional network could enhance collaboration of international academic initiatives related to technology for active ageing, such as the World Conference of Gerontechnology.²²⁵ Furthermore, it could consider publishing a regional technology for active ageing academic journal, similar to the academic journal published by the International Society for Gerontechnology.²²⁶ All of the various forms of knowledge exchange could be collated onto the regional network's website.²²⁷

²²⁰ Renmin University of China (2019). *The 3rd China-Japan Forum on Smart Senior Care at Renmin University of China*. Available at <https://www.ruc.edu.cn/archives/32974>

²²¹ The Open University of Hong Kong (2020). *International Conference on Gerontechnology*. Available at <http://icg2020.ouhk.edu.hk/index.html>

²²² ARTNET on STI (2019). *About ARTNET on STI Policy*. Available at <https://artnet.unescap.org/sti/about>

²²³ ARTNET on STI (2019). *Inclusive Technology and Innovative Policies*. Available at <https://artnet.unescap.org/sti/policy/inclusive-technology-innovation>

²²⁴ The Asia Pacific Observatory on Health Systems and Policies (2021). *About Us*. Available at http://www.searo.who.int/entity/asia_pacific_observatory/about/en/

²²⁵ International Society for Gerontechnology (2020). *The 12th World Conference of Gerontechnology*. Available at <https://journal.gerontechnology.org/ISGN/news/SG2020.html>

²²⁶ International Society for Gerontechnology (2020). *Gerontechnology Official Journal of the International Society for Gerontechnology*. Available at <https://journal.gerontechnology.org/>

²²⁷ This would be similar to ARTNET on STI Policy's "Knowledge Exchange on Inclusive Technology and Innovation Policies" page, which publishes information on related intergovernmental discussions, forums, summits and workshops. Available at <https://artnet.unescap.org/sti/policy/inclusive-technology-innovation/knowledge-exchange>

Launch regional technology for active ageing competitions

Gerontech Youth Challenge in Hong Kong, China illustrated how competitions can successfully attract talents other than established industry experts into developing technology for active ageing. A regional example is the Healthy Aging Prize for Asian Innovation, established by the Japanese government's Asia Health and Wellbeing Initiative.²²⁸ It invites applicants from East and Southeast Asian countries to submit innovative proposals in different categories, including technology & innovation.²²⁹ **Riding on the momentum around such existing initiatives, regional competitions on technology for active ageing could be launched to build capacity within the industry's ecosystem.**

Product Development Stage

Testbeds: Testbeds are necessary for companies to evaluate product viability, receive user feedback for product enhancement and conduct market research. However, as the number of testbeds for technology for active ageing products and services in the region remains limited, regional collaboration could help maximize testbed capabilities.

Create a regional testbed collaboration network

Collaborations have already begun on a small scale

in the region. For example, the gait rehabilitation robot "Exowalk" from the Republic of Korea's National Rehabilitation Center conducted clinical research for stroke survivors at China's Wangjing Hospital in 2017.²³⁰

While not specifically related to technology for active ageing, the EU's Horizon 2020 program has Open Innovation Test Beds where entities offer access to their physical facilities, capabilities and services required for the development, testing and upscaling of nanotechnology and advanced materials in industrial environments. Guidelines stipulate how testbeds are defined and what the access conditions for parties interested in using the facilities are.²³¹ **The regional testbed collaboration network could similarly issue guidelines to specify what testbeds qualify and what the access conditions are, as well as facilitate the actual use of the shared testbeds in the region.**

Scaling: Since the technology for active ageing industry is relatively new, in addition to the typical hurdles that start-ups face, there are few incubation programs or accelerators available to offer industry-specific mentorship and business support to technology for active ageing start-ups.

Provide funding and mentorship for start-up incubation and acceleration

Funding that operates as an incubator and accelerator

²²⁸ Asia Health and Wellbeing Initiative (2021). *Healthy Aging Prize for Asian Innovation*. Available at <https://www.ahwin.org/award/>

²²⁹ The winner of the technology & innovation category from the inaugural 2020 competition was Buddy HomeCare from Thailand. Buddy HomeCare trains indigenous youths living in poverty to use their mobile app-based health care management and monitoring system to provide individual care plans for older persons. Available at <https://www.ahwin.org/award/>

²³⁰ Song, Won-Kyung (2019). Page 19 of *From Research to Practice Bridging robotics research with clinical value in Korean municipal healthcare*. National Rehabilitation Center. Available at https://www.whinn.dk/media/1799/8-song-191120e_whinn2019_wksong_.pdf

²³¹ European Commission Horizon 2020 (2017). *Explanatory Notes on Open Innovation Test Beds*. Available at https://ec.europa.eu/research/participants/data/ref/h2020/other/guides_for_applicants/h2020-supp-info-innotestbeds-18-20_en.pdf

for technology for active ageing start-ups could be set up to provide accepted start-ups with both financial assistance and mentorship opportunities.

For example, the EU's AAL Programme has funded over 250 technology for active ageing projects. In addition to funding, approved projects have access to AAL2Business, a business support and mentorship program specific to the technology for active ageing industry.²³² A unique aspect of the AAL Programme is that project applicants must apply with a consortium of a business partner, SME partner and end-user organization.²³³ This helps overcome the communication gap between end-users and companies and ensures that products and services are user-friendly. The regional fund could consider implementing a similar application requirement, requiring project applicants to have a consortium with business and end-user organizations. It could also encourage partnership between organizations from different countries to promote regional collaboration.

Data: A significant challenge within the technology for active ageing ecosystem is the lack of relevant data. The availability of health care data helps align users' needs and companies' ability to provide tailored solutions. However, issues of data privacy make it difficult for countries to disclose health care data. In addition, the availability of market data helps attract private investment. Although there exists general information about the Silver Economy,²³⁴ market data

specific to technology for active ageing products and services remains limited.

Develop a regional database with health care-related analytical results

While Japan's Next Generation Medical Infrastructure Act effectively enables access to anonymized health care data, it may be difficult to create a cross-border database of different countries' national health care data of older persons given domestic data privacy and security regulations. Instead of publishing raw health care data, **a regional database containing analytical results of national health care data related to older persons could be developed.**

To create such a database, governments could improve access to local health care data, which enables product developers to conduct needs assessment and product-related analysis. The regional database could seek to gather and share these analytical results as well as related academic publications, thereby enabling better assessment of the health care needs among older persons within the region and development of tailored solutions. A good reference is the World Health Organization's International Clinical Trials Registry Platform, a voluntary platform linking clinical trials registers at a single access point, which enables a complete view of research for all persons involved in health care decision making.²³⁵ The COVID-19 Research Database Publications is another example offering

232 AAL Programme (n.d.). *Going to market*. Available at <http://www.aal-europe.eu/programme-actions/going-to-market/>

233 AAL Programme (n.d.). *How to apply for funding*. Available at <http://www.aal-europe.eu/programme-actions/how-to-apply-for-funding/>

234 The Silver Economy can be defined as the economic opportunities arising from the public and consumer expenditure related to population ageing. Available at <http://ec.europa.eu/research/innovation-union/pdf/active-healthy-ageing/silvereco.pdf>

235 World Health Organization (2021). *International Clinical Trials Registry Platform*. Available at <https://www.who.int/clinical-trials-registry-platform>

de-identified data organized by partners in both the public and private sector.²³⁶

Collect and disseminate technology for active ageing market information and data

There is currently limited information on the technology for active ageing market. An institutional exception is the European Union, which has set up the “Market Observatory” as the main reference source of information and data on the technology for active ageing market.²³⁷ While still in its early stages, the Market Observatory has released some publications on existing market and investment information in Europe related to technology for active ageing.²³⁸ Some industry experts also keep track of latest market developments, such as Laurie Orlov, US-based founder of Aging and Health Technology Watch,²³⁹ and Keren Etkin, Israel-based founder of the Gerontechnologist.²⁴⁰ Similar to these initiatives, **a regional platform could be set up to gather and publish information and data on the technology for active ageing market in the Asia-Pacific region.** In addition, comparative studies on the supply and demand of technology for older persons in different countries, as well as the related policies and regulations, could provide useful information for market participants to grasp the

opportunity of the rapidly growing technology for active ageing market.

Adoption Stage

User budgetary constraints: A significant challenge within the technology for ageing ecosystem is the budgetary constraint of end-users such as older persons and service units. This is because many technologies for active ageing have high price points that end-users cannot afford to purchase or maintain. Governments from developed economies generally address this issue through product subsidies, yet it may be difficult for developing countries to provide such support.

Leverage foreign aid initiatives to enable adoption of technology for active ageing

Various countries in the Asia-Pacific region offer foreign aid to other countries. For example, Japan and the Republic of Korea provide official development assistance, while China offers foreign aid through the China International Development Cooperation Agency.²⁴¹ Many forms of aid are offered in areas related to technology and health care. Japan provides developing countries with equipment utilizing

²³⁶ COVID-19 Research Database (n.d.). Available at <https://covid19researchdatabase.org/>

²³⁷ AAL Programme (n.d.). *Market Observatory*. Available at <http://www.aal-europe.eu/programme-actions/market-observatory/>

²³⁸ Kurt Salmon and IDC (2014). *Final Report A Study concerning a Market Observatory in the Ambient Assisted Living field*. Available at <http://www.aal-europe.eu/wp-content/uploads/2016/03/Final-report-SA-Market-observatory.pdf>; Technopolis Group (2018). *AAL Market and Investment Report*. Available at <http://www.aal-europe.eu/wp-content/uploads/2018/11/AAL-Market-report-Technopolis-180604.pdf>

²³⁹ The Aging and Health Technology watch provides market research, trends, blogs and reports with thought leadership, analysis and guidance about health and ageing-related technologies and services on the website. Available at <https://www.ageinplacetech.com/>

²⁴⁰ The Gerontechnologist publishes an ‘AgeTech Digest’ every month about trends in the ‘AgeTech’ scene. Available at <https://www.thegerontechnologist.com/>

²⁴¹ Cheng Cheng (2019). *The Logic Behind China’s Foreign Aid Agency*. Available at *Carnegie Endowment for International Peace*. Available at <https://carnegieendowment.org/2019/05/21/logic-behind-china-s-foreign-aid-agency-pub-79154>

Japanese technologies and systems, including medical technology and services.²⁴² In response to COVID-19, the Republic of Korea indicated that they would offer USD 5.15 million to six developing countries for different digital and green technologies.²⁴³ Similarly, China has set up a special COVID-19 fund worth RMB 2 billion, which has provided supplies to over 150 countries and international organizations.²⁴⁴ **These aid initiatives for technology and health care could be leveraged and better coordinated to promote the adoption of technology for active ageing, especially in developing countries.**²⁴⁵

Distribution: A complicated issue in the technology for active ageing ecosystem is supporting nationally successful companies and products in overseas distribution as they have to meet the standards of medical and safety requirements, which often vary from country to country. It could be costly for companies to overcome these regulatory barriers, thereby making overseas distribution and localization difficult.

Establish mutual recognition agreements (MRA) for relevant industrial standards

To avoid duplicate testing, inspection or certification, the Asia Pacific Accreditation Corporation (APAC) was

established in 2019 to help manage and expand MRAs in the Asia-Pacific region.²⁴⁶ APAC currently has 47 full members across 29 economies.²⁴⁷ **Leveraging on various countries' active participation in APAC, regional MRAs could be established to recognize national medical and safety standards related to technology for active ageing products in Asia and the Pacific.**

To conclude, in view of the unprecedented speed and scale of population ageing and its profound impacts on sustainable development, it is important to leverage technology to support older persons. **Apart from efforts at the national level, countries are recommended to strengthen (sub)regional collaboration on technology for active ageing to promote, systematize and institutionalize cooperation among relevant parties,** thereby jointly addressing the challenges of rapid population ageing and accelerating the implementation of the MIPAA and the 2030 Agenda for Sustainable Development.

²⁴² International Cooperation Bureau, Ministry of Foreign Affairs of Japan (2017). *Priority Policy for Development Cooperation FY2017*. Available at <https://www.mofa.go.jp/files/000259285.pdf>

²⁴³ KBS World (2020). *Seoul to Offer US\$5.15 mil. To Developing Nations for ODA Projects*. Available at https://world.kbs.co.kr/service/news_view.htm?lang=e&Seq_Code=155254

²⁴⁴ China International Development Cooperation Agency (2020). *China to expand COVID-19 cooperation special fund, says envoy at global pledging event*. Available at http://en.cidca.gov.cn/2020-05/06/c_484173.htm

²⁴⁵ For instance, countries could develop joint project on technology for active ageing funded by the official development assistance or foreign aid.

²⁴⁶ Asia Pacific Accreditation Cooperation (n.d.). *About APAC*. Available at <https://www.apac-accreditation.org/about/>

²⁴⁷ Asia Pacific Accreditation Cooperation (n.d.). *Members*. Available at <https://www.apac-accreditation.org/membership/>



Chapter IV. Strengthening Regional Collaboration on Technology for Active Ageing

Leveraging Technology for the Madrid International Plan of Action on Ageing; Experiences of China, Japan and the Republic of Korea



**Leveraging Technology for
the Madrid International Plan of Action on Ageing:
Experiences of China, Japan and the Republic of Korea**