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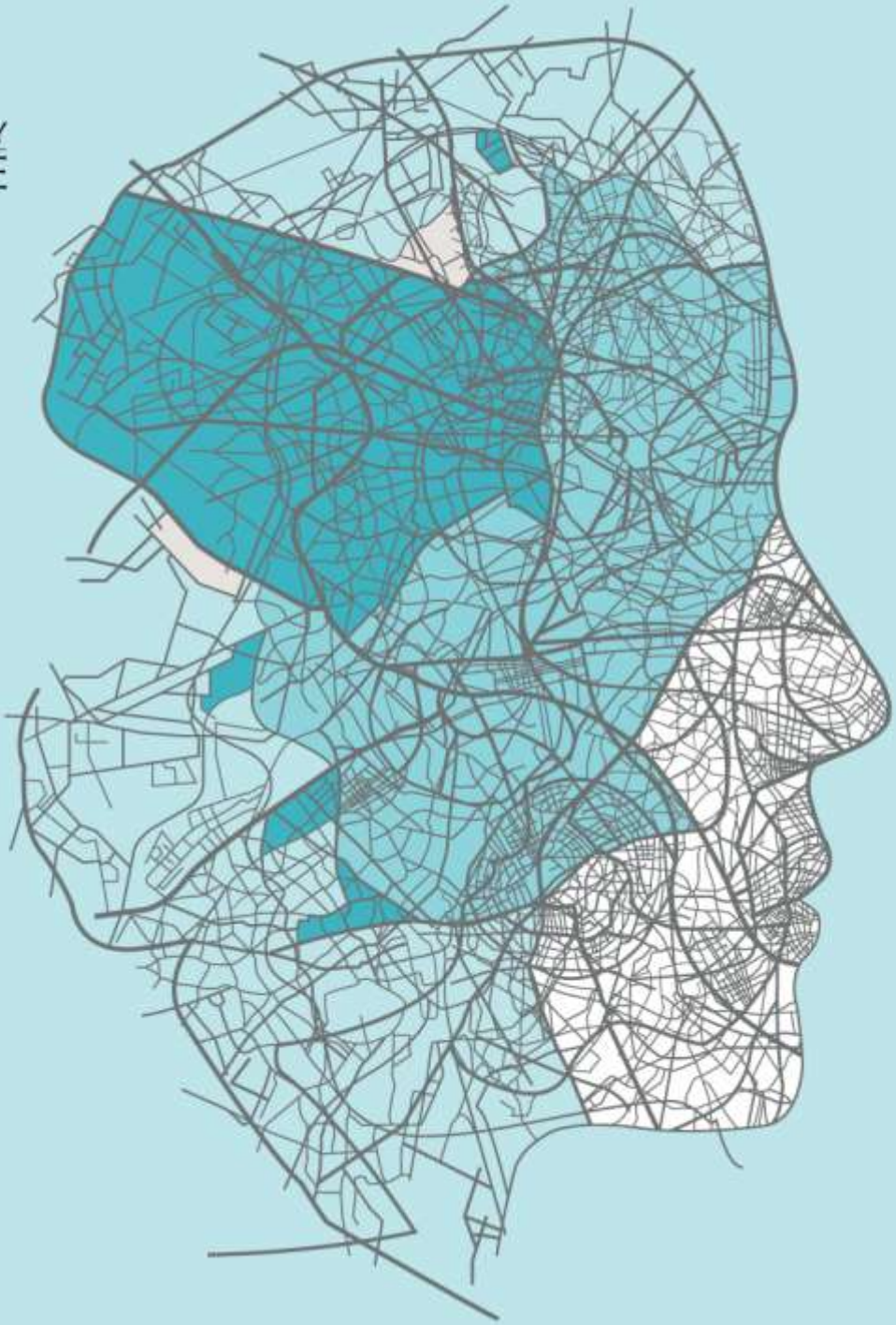

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Social, ethical and economic considerations of smart technologies for ageing well

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Executive summary

The 'Social, ethical and economic considerations of smart technologies for ageing well' project was funded by Office for Ageing Well, SA Health. It had a brief to focus on older people's views, perceived challenges, ideas and hopes for ageing well in the 'smart world'. In order to do this successfully the research team conducted a systematic literature review to identify the pertinent issues arising from previously conducted national and international research. From this review three particular smart technologies were selected, the Internet of Things (IoT), robotics and autonomous vehicles. A novel methodology, 'World Cafés', was used to elicit the thoughts and perceptions of older South Australians about how the technologies might help or hinder ageing in place. The literature review indicated that of these three, the latter had been explored the least, yet in the context of the World Cafés it was a hotly debated topic.

The following chapters detail the findings of this study and indicate a general acceptance of smart technologies by older South Australians, particularly for those technologies that would enable or assist ageing in place. A number of concerns were raised by older participants in the World Cafés around:

- Privacy – both personal privacy and privacy of data.
- Loss of autonomy in an increasingly monitored world.
- Issues of ownership and affordability were also discussed at length.

As well as consulting older South Australians regarding their perceptions of the value of smart technologies to assist them to stay at home longer, the research team engaged with a number of professional stakeholders including policy makers, service providers and drivers of new technology development. In this forum, the most pressing issues to emerge included issues around data monitoring, storage and analysis; workforce implications; infrastructure development; and customer acceptability. Stakeholders identified some specific elements that smart technology required if it was to be useful and appropriate including:

- Clear identification of the specific problem the technology is meant to address.
- Integration with the existing environment.
- Perceived value to the customer.
- A clear purpose to support, not replace, workers and carers.
- Issues of cost of technology to the consumer.

Researchers in the forum were keen to work with industry stakeholders to explore these issues and also to suggest possible technology solutions through a co-design process.

This pilot project aimed to explore the need for development of ethical and relevant smart ageing guidelines in the future. The pilot study has indicated that there is much more work to be done in this area and indeed the larger study is warranted. While there was significant literature on the ethics of smart technologies in the more recent published work, there remains little on using co-design principles when considering smart technologies outside universal design and specifically focussed on 'assisted ambient living' or ageing in place.

A key learning from this research is the willingness of older people to participate in co-design processes in the area of the development and use of smart technologies and for policy makers, service providers and researchers to work together with older people to develop these smart technologies, which will meet the needs of older people as well as addressing critical issues for these key stakeholders.

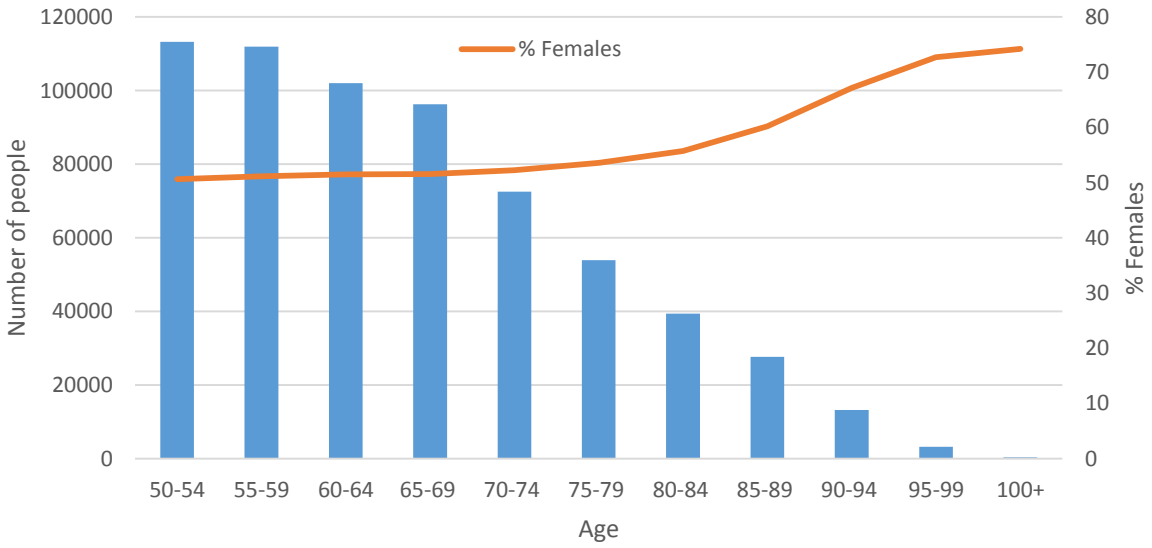
Chapter 1: Introduction

This pilot project sought the voices of older people about their perceptions, challenges and hopes for ageing well in the 'smart world'. Data were collected in three phases: a systematic review of national and international literature; a stakeholder forum with researchers, policy makers, service providers and drivers of new technology development; and a number of World Café round table discussions, which allowed older people to hear about and then discuss some examples of smart technology that may influence how we live in the future.

Globally, by 2025 the number of people aged 60 and over is likely to double, and by 2050 will reach two billion, with the vast majority of older people at this time living in low- and middle-income countries (UN 2015). The number of people aged 65+ in Australia at the last Census in 2016 was approximately 3.7 million people, or 15% of the total Australian population (ABS 2016). The number and proportion of older Australians is expected to continue to grow. By 2057, it is projected there will be 8.8 million older people in Australia (22% of the population); by 2097, 12.8 million people (25%) will be aged 65 and over (AIHW 2018).

South Australia (SA) has the oldest population of any mainland state/territory in Australia. According to the 2016 Census, 633,795 South Australians, or 37.8% of all people living in SA were aged 50+ (ABS 2016). This includes 306,601 people aged 65+ and 33,796 people aged 80+, as shown in Figure 1.

Figure 1: Population aged 50+, by age group and % females by age, South Australia, 2016

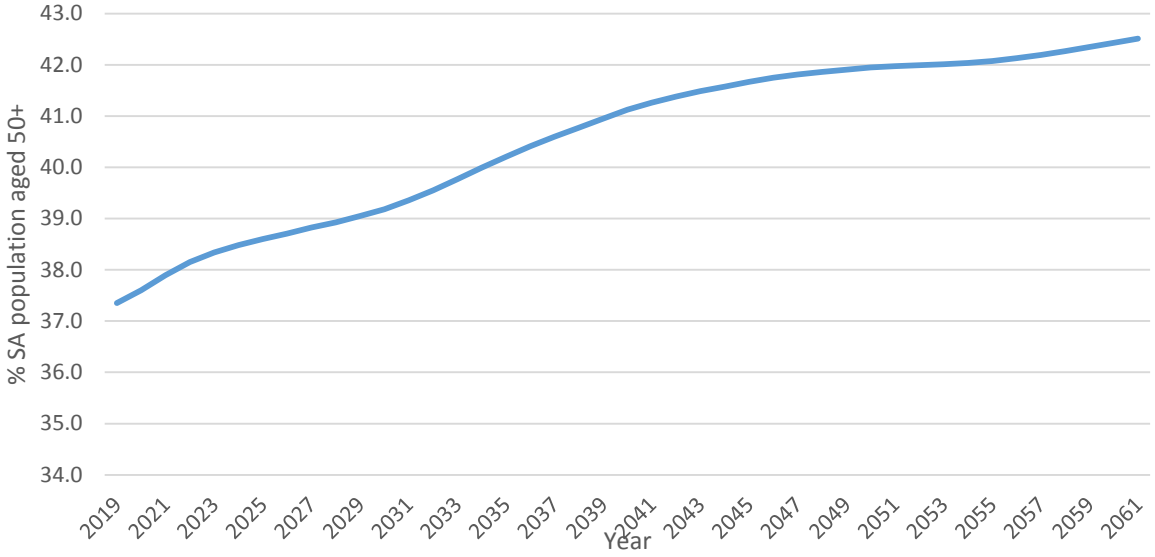


Source: ABS Census 2016

Both the total number and proportion of South Australia's population aged 50+ is expected to increase continually over time, as shown in Figure 2. The number of people aged 50+ in SA is projected to increase to 725,989 people (39% of the population) by 2025 and 921,813 people (42% of the population) by 2050. The number of people aged 65+ in SA is projected to increase to

386,387 people (21% of the population) by 2025 and 529,760 people (24% of the population) by 2050.

Figure 2: Projected percentage of the population aged 50+, 2019-2061, South Australia



Source: ABS Series B population projections data 2018, based on 2012 base data

Most Australians age in place, with less than six per cent of the 65+ years population living in supported age care at any one time. For some older Australians ageing in place requires additional support; this could be due to decreased physical or mental functioning concomitant with ageing. The Australian aged care system delivers services through a range of provider and care types within community-based and residential settings. The Commonwealth Home Support Programme (CHSP) provides a basic level of aged care services to support continued independence for people aged 65 and over living at home. The Home Care packages programme was amended in 2017 to include the 'Increasing Choice in Home Care' reforms which aims to be a more consumer-driven system. At 30 June 2017, there were around 71,400 Home Care recipients, and the majority (68%) were receiving care at Levels 1-2 (basic–moderate care needs). Home Care recipients were likely to be aged 65 and over (97%), with the average age of receiving Home Care at 80.2 years. The number of Home Care recipients has increased by 84% over the last 10 years, reflecting the preference of older Australians to age in place, and increased capacity of the system to deliver community-based care (AIHW 2018). However, with over 1000 'pathways' through the aged care system, significant wait times for appropriate level packages, and at a cost of $18.4 billion for 1.2 million people, Australia's current aged care system is not considered sustainable (AIHW 2019). Technologies which further increase autonomy, independence and the capacity of older people to age in place are flagged as one approach to alleviate pressure on this system both in Australia and internationally (Wilkowska et al 2018; Carnemolla 2018; Vichitvanichphong et al 2014).

Concerns about the societal burden imposed by an ageing population in Australia have been a recurrent theme in recent policy debates and a major influence on Australia's welfare reform over the past few decades. The AIHW (2014) has identified a series of challenges for the health system

as Australians age, including the increasing impact of chronic disease which becomes more prevalent as people age and live longer, as does the number of people living with a disability (AIHW 2014). The AIHW (2018) also notes an increasing demand for health services as people age, which is linked to increasing expectations from older people around how health services can better support them. This includes an increasing demand for technology, which is a significant component of increasing health budgets (AIHW 2018, Harris 2018).

Technology has the potential to shape and change societies, including those ageing in the community. Technological advances such as mobile applications for preventative health care, telehealth applications, assistive technologies for active ageing and independent living, and enhancing social connectedness via online networks all have the potential to change the very notion of what it means to age in place. Increasingly, technological solutions such as passive surveillance and monitoring related to healthcare, autonomous vehicles for independent travel, robotics for care or companionship and smart homes are suggested as smart solutions for ageing societies (McLean, 2011; Peek et al 2016; Pilotto et al 2018). These ideas are usually driven by developers of technologies as technical solutions to physical problems, and policy makers may see such technologies as facilitators for improving ageing in place outcomes and reducing the 'burden of an ageing population' on the health system; both groups, however, may overlook the social and ethical challenges these technologies may create for an older population (Doyle et al 2014; Soraghan et al 2014).

The convergence of technology and global ageing is driving new business opportunities, innovations in service delivery and the promise of a better life tomorrow for older adults and those who care for them. Despite its promise, while technology can introduce new solutions it can also create new problems. Successful development and integration of technology as a tool to transform supporting ageing well into global opportunity requires that individuals, families, business, and governments at all levels, address these potential key trade-offs: safety versus privacy; functionality versus complexity; service versus stigma; availability versus equity; health versus dignity; and lastly, high-tech versus high-touch (Coughlin, 2010).

In South Australia these questions have been explored in recent years through environments such as the 2016 OFTA/DIPT D3 Challenges, the Global Centre for Modern Ageing (formerly the Tonsley Precinct 'Living Lab') and the University of Adelaide's Smart Cities Consortium, which includes a focus on Smart Ageing. These avenues of exploration have raised important questions: How can we design and implement new technologies that address the needs of older people? How can we help older people to age in place in ways that they find socially, ethically and economically acceptable? What do older people value most about ageing in place? What role can new technologies play in facilitating these understandings of ageing well at home? Building on this recent work and public debate, this pilot study aimed to create an evidence base to inform the development of future in-depth research based in South Australia.

Chapter 2: Project aims and methods

The three main objectives of this study were:

- A comprehensive international literature review on current stakeholder perceptions of what is needed to age well and age in place, new 'smart' technologies for ageing well, and the perceived assets and challenges of using smart technologies in the home.
- Collation of preliminary data from community dwelling older people and other key stakeholders (e.g. tech developers and researchers, planners, developers, local government, aged care providers and policy makers) on their perceptions on what technology would enable ageing well and ageing in place, views and ideas on new 'smart' technologies, and the perceived assets and challenges of smart technologies in the home.
- Trial an innovative methodology, World Cafés, to collect data through public debate and consensus building. This trial will include identifying appropriate recruitment strategies, the most effective format, content required, data collection techniques, and appropriate data analysis.

Methods of primary data collection

Recruitment

World Café discussion groups were used to gather information for the study. A call for participants was made through three South Australian local councils: The City of Onkaparinga, The City of Playford and Port Pirie Council. Information about the study was made available using several targeted recruitment strategies including:

- articles in e-newsletters relevant to SA's older population (Office for Ageing Well's fortnightly digital magazine, WeekendPlus, and Council on the Ageing SA's 'The Plug-In' community website)
- distribution of the study information through council email lists, older person's reference group (Playford) and posters and information (Appendix B) to advertise the World Café sessions being held in their area.
- radio interview (Port Pirie)

World Café Format and Content

The World Café methodology is a simple, effective, and flexible format for hosting large group dialogue. A World Café is perhaps best described as a number of small focus groups running simultaneously. An underlying assumption of World Café events is that collective discussion can shift people's conceptions and encourage collective action. This is critical in a forward, blue sky thinking concept such as smart ageing. The principles used to develop the World Cafés for this project are based on the principles developed by Brown and Isaacs (2010), and further discussed on the website "The World Café": http://www.theworldcafe.com/key-concepts-resources/. An example of the schedule for a World Café can be seen in Appendix C.

A café ambience is created in order to facilitate conversation. In some versions, such as the one applied to this project, a degree of formality was retained to make sure that everyone had a chance to speak and that tables did not have too many participants. The venue for each World Café varied slightly:

- Onkaparinga used Community Meeting Rooms in the Council Chambers, which provided kitchen facilities, A/V facilities and room for three tables of participants, café style.
- Port Pirie used a meeting room with kitchen and A/V facilities, and a section of the library for the café tables.
- Playford Council used a large community meeting room containing kitchen and A/V facilities as well as the four tables used for the café discussions.

Each of the sessions in this project was introduced by the World Café facilitator (one of the project team) and this introduction was followed by a series of short videos about each of the smart technologies under discussion (the Internet of Things, robotics and autonomous vehicles). Each table had up to six participants and each table discussed one specific topic. Participants then moved around the tables until they had covered each topic.

All community participants in the study gave their time willingly and without any compensation, other than being eligible for a gift card, the winner of which was drawn from a list of participants at the end of the World Café session.

Videos for the World Cafes

Robotics

Elder Care Robots shows Olga dancing with 'Rudy' the robot. Rudy can assist around the house by carrying small items on a tray. The robot's creator states that 'we don't want to make decisions for them. We want to help them make decisions and really give the power back to them so that they can stay independent'. Olga converses with her daughter through a video screen on Rudy about Olga taking medication and her sleep quality. The robot's creator states that they are leveraging artificial intelligence to allow older people to make better decisions and stay in their home longer, which the American Association of Retired Persons says 90% of older people want to do.

Amazon's Alexa is a commonly available and widely-used robotic device. Alexa uses voice recognition and internet access to assist household residents with inquiries. In this demonstration

Alexa reads a book from Kindle, plays a track by The Beatles and adds items to the owner's grocery list.

Robots for the Elderly looks at the work of the Bristol Robotics Laboratory and its assisting living development programme aimed at helping older people feel empowered enough to remain at home in a situation where there is a shortage of carers. 'Molly' has several functions: medication and appointment reminder; a health and nutrition monitor, an alarm if the person falls over, and various entertainment and exercise functions – all operated by voice recognition capabilities. 'Molly' works in conjunction with smart garments which can take skin temperature, monitor how much the wearer is eating and drinking, heart rate and movement and incorporate all this into suggestions for how the older person could be living better. The Centre is also working on other, more humanoid robotics which can show empathy and interact as a human thereby giving a greater sense of engagement.

Internet of Things (IoT)

The Geeny System: is a consumer directed Internet of Things system directed specifically at providing care for older people in their own homes. The smart power socket system and connected online account allows an out-of-town daughter to monitor and react if her mother needs help. If the mother accidentally leaves the stove on, the socket will note that the lights are out and there is no other activity in the kitchen and can automatically shut off power to the stove. Anyone with access to the account and paired devices can also shut off a device remotely. The Geeny system connects mother and daughter via a keyring alarm which has a fall alert and it also allows the mother's GP to receive her blood pressure readings daily through a paired Geeny smart blood pressure monitor. The device notifies if the mother forgets to take her blood pressure and the doctor can receive and review the information when it is sent often saving the consumer a visit to the doctor's surgery.

Autonomous vehicles

How driverless cars will change cities gives a brief overview of the progression of car ownership, what this meant for social status in the past and declares that 'cars are divorcing their drivers'. The autonomous car sector is likely to affect jobs in any industry where drivers are required. The video claims we will experience a radical shift in how we move, where we live and what are cities look like. Using the City of Toronto as an example, it is shown that autonomous vehicles could fundamentally change urban space and road design – smaller, narrower roads can expand the public space. Between car parks and driveways, about one third of land in Canadian cities is used by cars that aren't moving. This could be drastically reduced to make better use of urban land. City income will also reduce through the loss of car park and speeding fine revenue. We may be only a decade away from a reality where computers are safer drivers than humans and at this point, is it ethical to allow humans to drive?

The future of car ownership: A transformation is upon us is an NRMA Insurance video suggesting that autonomous vehicles will improve access for the young, older people and those with a disability. As well as those with vision impairment or some other disability which affects their

ability to drive, some older people can just lose confidence and not being able to drive is a real barrier to living fully. The video shows Margaret who, after having been a driver for 50 years, suddenly can no longer drive. She points out that the simplest things – such as needing milk – require planning. She describes an autonomous vehicle as 'absolute bliss'.

World Café Discussions

Each table had up to 6 participants and each table discussed one specific technology theme. Participants then moved around the tables until they had covered each topic. Each table had a facilitator/ scribe (one of the research team) to record key discussion outcomes and audio recording was also taken with participants' permission. Although some pre-defined questions were agreed upon and utilised, discussions moved beyond these points as participants raised particular issues of concern to them. As well as speaking and listening, participants were encouraged to write down aspects of the discussions they considered to be key issues, which then informed subsequent participants as they rotated through the tables.

Once all participants had rotated through all the tables and had a chance to discuss all the topics, the key points from each table were collated by the project team (generally over the lunch break). The key points were then grouped into themes and after lunch, presented back to the group as a whole for comment and further discussion if desired.

Interactive Forum with researchers, industry representatives and technology experts

This project was keen to ensure that the viewpoints and issues for key stakeholders responsible for developing technologies and providing services were also included in this project. A "Think Tank" was convened at the University of Adelaide to begin a process of exploring the issues and barriers faced by aged care service providers and technology industry experts by bringing them together with university researchers to identify possible technology solutions that may be feasible and useful in addressing the everyday problems faced by people aiming to age in place and to assist the services that support them.

Researchers at the University of Adelaide have a very broad range of research capacity and expertise including mechanical engineering and systems thinking, mathematics, artificial intelligence/machine learning, and computer science and electronic engineering. These researchers came together with a variety of representatives from external organisations to discuss issues around smart technologies for older people and to identify opportunities for research which could apply research capabilities to real world situations.

Attendees at this Think Tank included representatives from eHomecare, ACH, the Global Centre for Modern Ageing, COTA SA, myhomecare, Sevenoaks Retirement Village, Resthaven, ElderCare, Uniting Communities, and the Centre for Creative Health.

The Think Tank was facilitated by Professor Mathias Baumert and began with a number of presentations from industry representatives. Five tables of participants then undertook a series of discussions around specific technologies that could be useful for older people/were feasible to develop and issues and barriers around the development and implementation of technologies for older people. The results of this discussion are reported in Chapter 5.

Chapter 3: Review of the literature

A review of the literature published between 2010 and 2019 regarding smart technologies and older adults within the context of assisting ageing in place was undertaken. The review excluded publications which were:

- disease or condition-specific,
- were not peer-reviewed (opinion pieces, commentaries and conference papers),
- not presented in English or where the full text could not be found,
- were quantitative in methodology,
- were specifically related to residential aged care,
- or did not report the views of older people in their results.

A systematic search of several databases (CINAHL, Scopus, PubMed, Web of Science) using the terms: [ageing OR aging OR aged OR older OR old OR senior] AND [technology OR smart home$ OR ICT$ OR robotics OR robots OR autonomous vehicles] brought forth 5,207 possible publications for review. Of these 1,583 were discarded due to irrelevancy based on subject matter. After the removal of duplicates, 3,614 studies were further distilled to 344 for full text review based on those discarded as irrelevant using the above criteria after reading of title and abstract. After a full text review, 63 articles were considered relevant and of high quality; of these 14 related to assistive technology and/or monitoring technologies in the home; 12 were focused on smart home technologies and/or the Internet of Things; 19 reported on various aspects of robotics and robot assistants; 16 papers were general papers on the attitudes, ethics and potential impacts of adoption of new technologies by older people. Only two publications could be found that were directly related to older people and autonomous vehicles. In light of this last result, a second search for research on attitudes and ethics of autonomous vehicles was conducted and a further four papers that reported results based on age cohorts were included.

Given the pace of development of the technologies involved in this field it is likely that reviews of this nature will be required regularly in order to keep the literature relevant and updated.

Robotics

Robotics were generally viewed favourably by older people as long as their function was perceived as useful and unobtrusive, and their design was not humanoid. Robots that could convey expression but did not attempt to look human and were smaller in stature were generally favoured over those which resembled humans in any form (Wu, Fassert et al 2012; Torta, Werner et al. 2014) and functionality was considered more important than appearance (Broadbent, Tamagawa et al 2012). Only a couple of studies reported the use of on-screen avatars as a 'robotic' feature and these were less favoured than a physical presence in the home (Pouke and Häkkilä 2013, Chi, Sparks et al. 2017, Shaked 2017). Some studies researched robotics amongst mixed aged groups of participants and generally, older participants were more in favour of robotic assistance around the home than either their family members or carers and professionals (Hall, Backonja et al. 2017). There was concern on the part of the latter that home robots might replace them in some caring functions (Zsiga, Edelmayer et al. 2013; Lehoux & Grimard 2018). There was

also an issue around removing human contact completely, and robots, while seen as useful, were not seen as a favourable alternative to human visits and caring, but rather as a supplementary part of the caring process (Lehoux & Grimard 2018). Professionals in particular commented on the additional health checks such as the appearance of sores or skin pallor and condition that come with activities such as showering an older person with mobility issues (Klein and Schlömer 2018).

Many older people viewed a robot as a companion of sorts depending on its interaction capabilities and ability to express emotion (Cavallo, Limosani et al 2014; Chi, Sparks et al. 2017). Most older adult study participants disliked the presence of a camera function on a home robot with concerns of privacy and some designers took this into consideration by replacing the video image with a heat sensor image. The sensitivity of images and sensors related to fall detection in particular were raised by participants in terms of false alarms and the ability of any type of surveillance machinery to detect general movement patterns (Broadbent, Tamagawa et al 2012; Wagner, Basran et al. 2012). For example, what if the homeowner was down on the floor but had not fallen – would a robot be able to tell the difference? Overall, although older adults were in favour of ambient assisted living (AAL) technologies most saw these as a future need rather than a present and immediate requirement and that in-home personal robots were not likely to be a reality in the near future (Bradford, Kasteren et al. 2018). Given that the majority of research projects into AAL attempted to recruit healthy older adults without any cognitive impairments or significant mobility issues this is unsurprising.

Participants were generally not in favour of a robot taking care of a simple task such as a shopping list citing this as a possible route to 'laziness' or a lessening of their mental capacity but a home robot undertaking menial physical tasks such as emptying a rubbish bin or vacuuming was acceptable (Cavallo, Limosani et al. 2014). Simultaneously however, more immediately important health-related activities such as medication reminders were considered appropriate (Broadbent, Tamagawa et al 2012). Similarly, family members and carers appear to be in favour of robots assisting with physical tasks such as person-transfer to bed/chair/shower but not to perform more intimate tasks such as showering and dressing (Broadbent, Tamagawa et al 2012).

The interaction competancies of robots varied in scope and depth. Where a robot could 'learn' conversation and develop syntax, the machine was seen more of as a social companion (Chi, Sparks et al. 2017; Kachouie, Sedighadeli & Abkenar 2017). 'Paro', a seal robot which was a companion despite the absence of any verbal scope, was well-liked amongst users because of its sympathetic facial expressions (Zsiga, Edelmayer et al. 2013). This suggests that 'animal' robots are seen as pleasing because they mimic animal attributes whereas 'human' robots are so far from realism that it is preferred they do not attempt to imitate human characteristics.

Internet of Things and Smart Homes

Literature specific to the Internet of Things (IoT) as a whole is sparse. The IoT often encompasses several interchangeable elements. In the case of universal design, smart homes or intelligent building control systems it might incorporate features such as voice/app-controlled blinds and lights and the ability to turn on and shut off electrical items such as heating, cooling and cooking

appliances remotely from smartphone app (Van Berlo 2011; Wong, Leung et al 2017; Shin, Park & Lee 2018). In an ageing-in-place scenario it could also include floor and door sensors, toilet flush measurements, bed sensors and medication box video/sensors. In this sense, the IoT is much more complex and has the potential therefore to become much more expensive and technologically complicated (Wong & Leung 2016).

The IoT can incorporate wearables, sensors for movement and falls, and cameras for tracking activity as well as general home automation. Some research suggests that these forms of monitoring and automation offer a sense of security (Huber and Jean-Camp 2016; Bradford, Kasteren et al 2018), although in the case of the Bradford study, a slight tendency for residents to modify their behaviour due to perceived surveillance was noted. In other studies important ethical challenges for smart houses were found, including cost-effectiveness, privacy, autonomy, informed consent, dignity, safety, and trust or privacy concerns tempered acceptance (Sanchez, Taylor & Bing-Jonsson 2017). However, Steinke, Bading et al (2014) showed that the higher the sense of need, the higher the levels of trust in the system and similarly Shin, Park & Lee (2018) showed that perceived usefulness has significant positive effects on purchase intention.

While studies on general ICT use and acceptance unrelated to smart home technology were excluded from the review, these have shown that there are many misconceptions about the acceptance and ability of older people when it comes to computer use (Soraghan, Hermann et al. 2014). In considering the control of smart home automation, studies found that voice control rather than the use of a touch screen control panel was more feasible for older adult users as long as the voice compatibility and language syntax had been considered at the design stage (Shaked 2017). Leaving aside the issues of affordability, the suitability of retrospectively adapting a current home to this technology and issues of ownership and responsibility, there appears to be a general acceptance of technology which seems far fetched now but which will likely be no different to the ubiquitous use of cars, microwaves and smart phones (Shin, Park & Lee 2018).

Monitoring and Surveillance

New surveillance technologies as a component of a suite of ‘ambient assisted living’ technologies – including body-worn monitors, passive environmental sensors, smart interfaces, and smart communications networks - are being developed at a rapid rate to improve the security and safety of at risk older people (Mortenson, Sixsmith & Beringer 2016). There appeared to be two types of papers represented in this review: firstly, those by technology developers who could see the value to health systems in limiting falls and other declines in functioning mainly with consideration only of the functionality, effectiveness and efficiency of the technology itself; and secondly, those papers which focused on the ethical implications of such surveillance systems on the privacy and autonomy of the older person.

Often seen as ‘enabling technologies for independent living’, ambient assisted living systems are purported to be an essential component to enhancing care in a cost-effective manner (Al-Shaqi, Mourshed & Rezgui 2016). In light of significant advances in telecommunication, computing and sensor miniaturization, as well as the ubiquity of mobile and connected devices in the home

embodying the Internet of Things (IoT), end-to-end solutions for ambient assisted living have become a reality. The premise of such applications is the continuous and most often real-time monitoring of the home environment. Several studies outlined the advantages of new surveillance systems in the early detection of declines in daily functioning, aiding health care professionals in providing timely and targeted preventive interventions (Al-Shaqi, Mourshed & Rezgui 2016; Pol, Van Nes et al 2016).

However, there is also a body of evidence outlining the ethical and moral issues associated with this approach to in-home health care. Zwijsen, Niemeijer & Hertogh (2011) found three main themes in their research that when it comes to use of AAL systems in the care of older people living at home, ethical debate appears not to be a priority for developers or marketers of these systems, with most systems not grounded in the lived experiences or needs of the older person (Pratesi, Sixsmith & Woolrych 2013). Some studies did show (as shown previously with smart home technologies) that sensor monitoring was more widely accepted when it created an opportunity or strategy to enable that person to remain living independently in their own home, such as when their health declines (Claes, Devriendt et al 2015; Pol, Van Nes et al 2016). However, older respondents in other studies expressed concerns that monitoring systems might be used to replace face-to-face/hands-on care to cut costs, shift agency and autonomy away from the older person, introduce new forms of dependency, and/or raise issues around privacy and security (Boise, Wild et al 2013; Mort, Roberts et al 2015).

Overall, research reviewed in this study strongly advocated for ethical and social questions to be considered in tandem with technical and policy developments. Some felt that older people are too often excluded from the design of the AAL and surveillance systems that are meant to support them.

Autonomous Vehicles

Most of the academic literature relating to autonomous vehicles (AVs) has thus far been focused on technical aspects of their design and operation; with only a small body of emerging work exploring the social implications of these vehicles in terms of the community benefits, planning challenges and social change (e.g., Crayton & Meier 2017; Fagnant & Kockelman 2015; Fleetwood 2017). A few studies have noted that AVs may provide some advantages for an ageing population (e.g.: Eby et al. 2016; Harper, Hendrickson et al 2016; Shergold et al. 2015), primarily through their ability to compensate for the potential reductions in physical and cognitive function in older age (Yang & Coughlin 2014; Sall, Choi & Feng 2018).

With more older drivers expected on the roads in coming years, their increased likelihood of being involved in an accident, and a higher likelihood of fatal injuries from road accidents (Sall, Choi & Feng 2018), it is surprising that there only a small number of published studies expressly looking at the likely adoption of AVs by older people. In fact, this systematic review only found two papers (Sall, Choi & Feng 2018; Pettigrew, Cronin & Norman 2019). Sall et al (2018) focused their USA based publication on age-related changes in attention, memory, spatial cognition and executive function, and the ways these physiological changes may affect interaction with new developments

in AVs. This includes exploring semi-autonomous advances in vehicle automation such as crash mitigation systems (blind spot warnings, automatic braking if too close to another vehicle etc.) and other features such as automatic lights, self-parking and cruise control. These were perceived to be favourable and acceptable improvements by older participants. Note: this aligned well with comments from participants in the South Australian World Cafés. Full automation of vehicles (driverless cars) were seen by Sall et al (2018) as potentially providing a stress free transportation service to older people who were unable to drive any longer or for those with limited access to other forms of public transport, but they acknowledge that there has been limited research into how older people would interact with highly, or fully automated vehicles. They suggest that automated vehicles may need additional warnings and controls to compensate for the loss of cognitive and physical functioning in an older demographic of users.

Pettigrew et al's (2019) paper is based on an Australian study with 43 key stakeholders across the policy sector but did not engage with older people themselves on the issue of AVs. They point out that research in this area is in its infancy, with little evidence that the benefits these vehicles hold for an older population are being explored by the developers of AV technologies or those who are responsible for developing the physical, social, and legal infrastructure that is needed to facilitate any wide-scale deployment. Their interviews with policymakers, technology developers and planners showed that most of the focus was on population-wide benefits. When asked to explore the benefits and challenges for this demographic, interviewees acknowledged there were many potential benefits for this age cohort but also raised potential challenges e.g.: that older people will lack the income needed to purchase a personal AV, generational differences in car ownership that may impact on their willingness to rely on shared vehicles rather than private ownership, and the tendency for new technology adoption rates to decrease with age.

No studies were found that specifically explored the perceptions of the older population to these issues. Studies that looked more generally at population-wide attitudes to AVs highlighted concerns related to perceived safety, trust and control issues, and the importance of providing the public with concrete information about AVs to address fear levels, and to resolve trust and control issues for the subset of older respondents (Hulse et al 2018; Pettigrew, Worrall et al. 2019; Cunningham, Regan et al 2019). With Hulse et al (2018) finding that older participants tended to have less agreement with potential benefits associated with AVs while also expressing higher levels of concern for potential AV-related issues and a greater reluctance to want to use an AV under most conditions. They were also seen as less willing to pay for AV-related technology and services.

Common themes across technology realms

Although one of the most thoroughly discussed elements of the South Australian World Café groups, views on use of autonomous vehicles by older people were largely absent from studies extracted for this review. Wearables, such as smart garments and monitors, and robotics that can be incorporated into an Internet of Things (IoT) scenario, which assists ageing-in-place or ambient assisted living (AAL), featured heavily in the reviewed literature separately but rarely as a whole IoT solution to ageing in place. Common themes in the literature centred on security both of the

person and personal data as well as system stability in terms of connection and reliability. In this latter aspect many papers were highly technical and concerned with transmission capabilities and sensor types or reported prospective designs and projects, and in this case were read for background knowledge but excluded from the review proper since the focus of this study was on the issues of interest to older people with regard to a smart home environment directly. The design of robotics, lessening of human contact, privacy and perceived usefulness were main themes of the literature with reduction of personal capacity, affordability, ownership and maintenance recurring to a lesser extent.

Issues of Privacy, Safety and Control

The concerns about privacy, security, safety and autonomy are intertwined with control. The ethical element of monitoring required for some telehealth features of a smart home were previously often disregarded by researchers. More recently this issue has been brought to the fore (see Mort, Roberts et al 2015; Mortenson, Sixsmith & Beringer 2016; Sanchez, Taylor & Bing-Jonsson 2017) and in studies where older adults have been recruited in a co-design environment it is clearly an important issue (Soraghan, Hermann & Boyle 2014; Huber & Jean Camp 2016).

As well as issues with surveillance, participants were concerned about who might have access to their data – and this applied to technological advances more broadly including smart homes, personal monitoring, autonomous vehicles and use of robotics. While generally accepting of the purpose of medical personnel reviewing sensor and monitoring data, some were less keen on family members having access to this information, feeling it robbed them of personal autonomy and even status as a parent (Lorenzen-Huber, Camp et al 2011; Chung, Demiris & Thompson 2016; Sanchez, Taylor & Bing-Jonsson 2017).

Cost, ownership, and maintenance of technologies

All of these technologies have supplementary issues related to affordability, upgrade, maintenance and sometimes even ownership with the potential for even wider gaps in the digital divde in the older population. Many studies results claimed that participants were in favour of the added technology if it was government-funded i.e. part of their healthcare, but were not keen to pay for it themselves or ask family members to contribute (Wong & Leung 2016; Chung, Demiris & Thompson 2016; Rogers & Mitzner 2017). Much of the technical literature excluded from this review revolved around sensors, battery life, and ubiquitous, linkable computer systems. While these articles were not directly related to end user views on new technologies, these issues will impact the development of the technologies in so far as upgrading, maintenance and replacement costs go. Ownership is also an issue as far as retrofitting homes, adding to or upgrading systems is concerned. For example; if competitors such as Google™ and Samsung™ develop non-compatible operating platforms, how do newly-developed elements become incorporated into existing systems? How do engineering or technology development firms decide which one to develop their product for? How does this affect market saturation and ultimately, cost, because the more people who use these technologies the less exclusive they become, ergo, they become more affordable. Universal design or adaptable housing aims to incorporate smart technology into homes regardless of the age or physical needs of the occupier.

Conclusion

Overall the literature reveals a generally positive response to the role smart technology can play in enabling autonomy and independence for ageing-in-place. Future technological developments, where end users are a part of a co-design process, may resolve some of the ethical issues around privacy and surveillance, and the features of robotic assistants or driverless cars, which are currently perceived negatively by older adult end users. However, overall, the literature suggests that ambient assisted living technologies as they stand are a more favourable alternative for older people than moving into residential aged care.

Future research projects could look more closely at perceptions and likely adoption of newer technologies such as autonomous vehicles amongst older adults as well as developing comprehensive IoT and Smart Home scenarios related to ageing-in-place. Living Labs that allow for a 'come and try' process that contributes to co-designing new technologies would allow a more targeted response to the needs and preferences of an older population. In addition, more work needs to be done on costing such design elements for a standard Australian house in order to gauge the useability and affordability these seemingly futuristic technologies could be for the average older Australian.

Chapter 4: Results

1. Roundtable: researchers, industry representatives and technology experts

Prior to the series of World Cafés with older South Australians, a roundtable discussion or 'Think Tank' was carried out at the University of Adelaide with over 20 professional stakeholders including policy makers, service providers and drivers of new technology development. The initial process of the 'Think Tank' had a similar approach to the World Café consultations with older people, in that a series of presentations from industry and researchers began the session and then discussions occurred at each table with results fed back to wider group. All participants in the Technology Roundtable were highly engaged and a series of key issues and ideas were identified and discussed, including:

- For Industry participants:
    - Smart homes produce data – what do you do with the data, how do you analyse it?
    - Technology has workforce implications – someone has to monitor, someone has to act on the information, someone needs to know what the information means
    - Technology requires Infrastructure: it must be integrated into the environment and may require modification to buildings to accommodate it
    - How do customers feel about it? Does it look right? Does it interfere with their life? Will other people accept it?
    - The cost of technology was raised as an issue, both from the consumer's perspective and from an Industry perspective in that the cost often made it difficult for the sale of their technology
- Industry participants suggested, that for technology to be useful and appropriate, it must be:
    - Integrated to the environment
    - Valuable to the customer
    - Consider whether the customer might have memory loss
    - Identify specifically what problem is it solving
    - Needs to be familiar for customers who are using it
    - Should automate non-care tasks to free up care staff to do more care
- Researchers were keen to work with industry to identify such issues and to suggest possible technology solutions. Other researchers suggested that co-design and extensive consultations with consumers could assist in identifying answers to the challenges and issues raised.
- Technology developers felt that there were numerous opportunities for the development of technologies to support healthy ageing.

Overall, whilst Industry participants were keen to discuss the issues for them in using new technologies to support their customers, they felt that there were many barriers to overcome. Technology developers were more positive about possible responses whilst researchers noted the significant opportunities arising for future researchers both in the area of technology development and consumer engagement.

2. World Cafés with older South Australians

Three World Café sessions were held in total: one in Adelaide's southern suburbs, one in the northern suburbs and one in the regional area of Port Pirie. These locations were deliberately chosen for their socio-economic profiles and, given the topic and the assumed connectivity issues in regional and rural areas, the research team felt it important that an area far outside the metropolitan area of Adelaide was included.

Demographic Summary

A total of 41 older people attended the three World Cafés.

	Noarlunga	Port Pirie	Playford
Date	31/5/2019	3/7/2019	4/7/2019
No. of participants	15	8	18
Gender	Not collected	M:1 F: 7	M: 2 F: 16
Age Range	Not collected	51 - 60: 0 61 - 70: 2 71 - 80: 2 81 - 90 4 >90: 0	51 - 60: 2 61 - 70: 2 71 - 80: 8 81 - 90: 5 >90: 1
No of tables	3 tables: IoT; autonomous vehicles, and robotics. All participants rotated through the 3 tables	2 tables: IoT; autonomous vehicles, and robotics. All participants rotated through the 2 tables	4 tables: IoT; smart wearables, autonomous vehicles, and robotics. All participants rotated through the 4 tables

Table 1: Demographic details, World Cafés 2019.

Analysis of World Café discussions

After introductions and viewing the videos described in Chapter 2, World Café attendees were asked to consider the following questions with regard to each of the technologies.

- What are some of the good things that could happen from having this technology?
- What are some of the things you would NOT like about this technology?
- Would it make life better…or more complicated?
- Think about what it might cost you – perhaps in terms of money, privacy, in having to learn how to use them, in changing the way you live your life.
- Would it be worth it, if it meant you could stay at home longer?

The following section reports the results of the analyses of the World Café discussions and describes the themes which emerged from the conversations held around the three types of technology. Where one group differed from the others, this is clarified and points made by way of explanation.

The Port Pirie World Café differed from the two urban World Cafés in a number of ways. There were fewer people attending the Port Pirie World Café compared to the other two World Cafés, but participants were still highly engaged. The Port Pirie participants were particularly keen to discuss the use of technology in the rural context and to identify what might be useful and what

might not work for them. There was a stronger focus on the role of volunteers and neighbours supporting each other and hence a perceived lesser need for technological support.

Theme One: Autonomous vehicles

Overall, there was considerable discussion about the use of autonomous vehicles in each of the three World Cafés and it was in this area that the sharpest differences between the two urban World Cafés and the rural Port Pirie World Café were most noticeable. All participants could see positives for the use of autonomous vehicles, and they could identify specific situations where they personally might find them useful. However, a number of concerns were also raised, some of which were identified as issues for all the nominated technologies e.g. loss of jobs and cost, and others that were specific to autonomous vehicles e.g. safety and utility, particularly in rural areas.

Participants suggested many of the technologies related to (semi) autonomous vehicles were already a part of daily life in vehicles; including automatic transmission, antilock braking, cruise control, reversing cameras, semi-automatic parking and automatic lights or windscreen wipers. They also noted that driverless trains were already common in Europe and that the O-Bahn buses in Adelaide run over tracked sections without driver control.

One participant described traveling on a driverless minibus being trialed to service transfer between a local hospital and the railway station. She observed that a particular benefit of the service was that it allowed people to alight directly at the front entrance without needing to find and pay for parking or – for those with mobility issues – to walk from the car to the entrance. The cost and ease of parking at hospitals was a common problem and switching from owning a car to calling up an on-demand autonomous vehicle was considered a way to solve that issue. Participants viewed the ability to call up a vehicle as preferable to owning their own autonomous vehicle, suggesting older people are willing to see autonomous vehicles as part of a shared transport system. Participants also used examples from their own experience of adjusting to changes in car models to support their contention that people would get used to the new technology in time.

Societal positives of autonomous vehicles

Participants recognised that driverless cars will allow people independence of movement and autonomy; particularly for those who have had to surrender their drivers' license or have mobility

issues and rely on others to get about. Reduced car accidents were considered likely to free up hospital beds and medical personnel for work elsewhere in the health system, and participants suggested that this would take some of the current pressure off the hospitals. One participant also talked about *"a country*" where pollution levels have gone down because of the use of electric driverless vehicles, pointing out the positives for the environment.

Impact on jobs

A number of participants expressed concern over loss of jobs and asked how this would be mitigated: "*My main thing is loss of jobs. I can't get over it. What are we going to be doing?*" They saw that the jobs of taxi, bus, tram and truck drivers may be threatened by a rise in autonomous vehicles. There was concern that this will affect the "*standard of living*" for Australia as a whole. In addition, participants noted that people will not need a license, "*so that is another job gone*". However, participants also recognised that loss of jobs in one area may mean that they may be gained in another. One participant used the example of an automatic door which took the place of a doorman only to later be replaced by a 'greeter' (i.e. someone whose job is to greet people at the entrance to a shop or establishment). Similarly, they noted that conductors had been removed from Adelaide trams and trains but now personnel are used to provide security particularly on Friday and Saturday nights instead.

Loss of human contact

Participants expressed concern about the impersonal nature of new technologies such as autonomous vehicles and the potential loss of day to day human interaction. They emphasised the value of the interaction that older people currently enjoyed with volunteer drivers, bus drivers or regular taxi drivers. One participant suggested: "*I think there is going to be more social problems and more mental problems…no-one is coming across on the human side of this*." This loss of the presence of others was also considered in terms of safety – who would be there to help you get in and out of an autonomous vehicle, who helps if there is an accident or an issue with the vehicle?

Cost

Concern was expressed about the cost, particularly in the early days of roll-out. One participant asked: "*New technology is always very expensive when it first comes out. Does the cost of a driverless car, that is a community or private but shared resource, outweigh the cost of owning your own vehicle?*" There was recognition by most participants that in time the costs are likely to go down, as they have with other new technologies (solar panels for housing was used as one example here). Besides the issues of private ownership costs others saw that continuous use of autonomous vehicles as part of a 'share society' model would also have long term financial considerations – with concerns expressed over who is likely to own the fleets of driverless cars and how pricing would be regulated. Issues were also raised about how you would pay for trips in driverless cars, the reliance on using a credit card or on-line booking and paying system meaning banking details and trip details are shared with others without your control. Most people saw the concept of a shared system of autonomous vehicles as costing more over the long term than current systems of shared and private ownership for the individual over time.

Ownership

One of the strongest themes to emerge from the discussion about autonomous vehicles was the question of ownership. This related to the vehicles themselves, the infrastructure (charging stations, storage facilities), running and service costs, and insurance. Concerns were raised about ownership by overseas companies and/or ownership monopolies and the issues this raised about general responsibility for events associated with the vehicles, pricing of trips and regulations. Very few participants talked about preferring to own a vehicle as an individual versus using one as part of a shared society.

Loss of the responsible driver/personal safety

Some participants feared that removing the 'responsible driver' from a vehicle would make the potential for attack more likely, particularly in shared ride situations such as in small buses, mini vans and other multiple user situations. On the other hand, participants did recognise that it would mean that it would be very difficult to steal a car. Participants were also concerned that currently on the trains people don't validate their tickets until the inspector gets on so they wondered how autonomous vehicles could ensure payment. Some participants thought it could be like the automatic toll readers found currently in cars but perhaps it would be an individual reader on your phone or a swipe card like a bus pass.

Specific Rural Concerns

One person suggested that in a geographically small country, for example the UK, a system of autonomous vehicles might work or perhaps in a defined Australian urban environment but they could not see it happening in rural Australia because of the low population levels and the large distances that are regularly travelled. Although rural participants thought that autonomous vehicles were generally a good idea, they felt that they were really perceived or designed for use in the cities. Participants queried how autonomous vehicles could be used on farms (e.g. motor bikes, tractors or utilities) or in trucking animals where the driver is responsible not only for driving, but also for the welfare of the animals they are carrying. Another rural specific concern was the ability of autonomous vehicles to deal with wildlife on the roads, such as kangaroos, whose behaviour is very erratic and unpredictable.

Whilst participants at all three World Cafés raised the issue of the importance of infrastructure such as charging stations, the rural World Café noted the very significant distances that vehicles are required to travel in rural and remote Australia and questioned the ability of charging stations to cope with this. This may be based on the assumption that electric vehicles would not have sufficient range but it also may reflect that demand would not be high enough to support maintaining fleets of autonomous electric vehicles in rural areas and that the times to cover the distances would be too high, making autonomous vehicle fleets unworkable.

Port Pirie participants felt that if autonomous vehicles were to function effectively in rural areas, they would need to be in private ownership as rural life has specific needs (including different vehicles for different tasks) and cars need to be available at all times. One participant in particular,

noted that it would be very hard to learn how to trust an autonomous vehicle and the lack of control would be difficult to cope with.

Theme Two: Robotics

Across the three World Cafés, participants recognised and could perceive, to varying degrees, the value of robotics in supporting roles to increase safety and security, assist in home, for personal care, and to facilitate communication and social engagement. However, a central theme across discussions was participants' discomfort with the idea of a robot *replacing* face-to-face human interaction and potentially leading to a decline in mental and social skills, and physical activity. Additionally, participants expressed concerns about the cost and effort involved in owning and maintaining a robot and the potential loss of jobs if robots were widely deployed. In Port Pirie, there was general agreement that even though robots could be helpful, they would definitely take jobs away and one participant exclaimed "*Where are all the jobs going? What are humans going to do?".* There was some fear that robots may be vulnerable to being 'hijacked' or 'hacked' and that society was moving into an era where there was total reliance on technology, which was not considered a good thing.

Practical uses of robotics

Some participants recognised that robotic technology was already used in society. They pointed to their mobile phones and use of Siri, assembly lines in manufacturing, robotic arms in surgery and robots used in care settings for dispensing drugs. There was some discussion about what was considered a robot: with some seeing robots in terms of a human-like android or robotic pet rather than a robotic drug dispenser or floor cleaner.

Robots were seen as potentially valuable in assisting in personal care, as an aid for home cleaning and in assisting with the movement of people. Participants thought robots might clean more thoroughly and be valuable for those tasks human cleaners could not safely undertake including

turning a mattress or putting things into a top cupboard. They also recognised that robots might be more patient than human carers and could assist in lifting people who had fallen or had difficulty in getting up. One participant reflecting on an instance in her own life where a robotic aid may have been useful said: "*I had a husband and if he slipped on the floor I had to get an ambulance to get him up".* On the other hand, in the absence of a person to make the judgement, they cautioned that it might not always be clear what action the robot should take. They suggested that the robot may need to have some human input around decision making – for example, whether it should lift the person or not. Robots for personal care were seen as "*less embarrassing*" and would not "*gossip*" like human carers; but some participants were concerned that information may be transferred to elsewhere anyway with issues around how robots recorded information about your movements and activities, and who had access to that information.

One issue raised in the Playford and Port Pirie World Cafés was the distaste for robots which tried to appear human. This was felt to be very inappropriate as robots are not humans and should not be presented as such. These sentiments were reflected in a lot of the literature from other studies on robotics. Participants said they would be more acceptable if they were presented as machines, e.g. the robotic vacuum cleaner was acceptable as it looked like a machine.

Some participants saw robots as a particular boon for those people with no other support who were homebound – that is when there was no human alternative including for those periods when the human carer had left for the day. Participants could particularly see the value of being able to call others through voice-activated robots or even in talking to the robot itself seeing this interaction as *"better than nothing*". Interestingly, Port Pirie participants did not agree with this, noting that they had a very supportive community who organised through service clubs and the Red Cross to support isolated people and ensure their safety through regular phone calls and visits.

People need human social contact and regular activity

Participants in all three World Cafés stressed the need for face-to-face and physical human contact. One group of women talked about how valuable their frequent meetings were as this interchange indicates:

> *Female 1: We meet up every week and we kiss each other on the cheek when we get there and we kiss each other when we go.*
>
> *Female 2: And that's something that you don't get from a machine*.

They did not see robots as replacements for this type of human contact and thought that robots might make people 'lazy' such that they missed out on human interaction. "*Doing things for yourself"* was seen as important for keeping you mentally and physically fit. This theme of not being idle and letting a machine do all the work came across strongly in all three World Café.

Participants also feared that future ubiquitous use of robots in the home may mean that people would become more socially isolated and alone, perhaps even losing skills in human relations including the ability to empathise and adjust to the needs of others.

Impact on jobs

A common theme was the fear that increased use of robotics, as with other smart technologies, would mean loss of jobs. They also queried whether robots would be able to undertake all the jobs required for daily life. For example, they questioned whether a robot could transfer people from a bed to a wheel chair or similar, or help with showering or dressing or other personal care. There were some doubts about the adaptability of robots, for example, in that some people were much heavier than others. They also doubted that loss of jobs in other sectors may mean that there would be more people available to work in the aged care sector. Participants suggested that, "*Not everyone can be a carer"* so it was not as simple as transferring people from one sector to another.

Vulnerability, data security and cost

Robots were seen as vulnerable to cyber-attack, hacking or infrastructure failure. Participants were also concerned that data could be transferred off-site without an individual's knowledge and this could violate personal privacy. Many participants saw the value of robotics particularly if it meant they could continue living at home but cautioned that it was important that the technology be adequately supported and part of a fuller suite of support systems. The robotics would need to be set up, monitored and maintained and some participants queried "*who is going to do that?".* The cost of servicing robotic aids, including paying for internet access, was seen by some as prohibitive and they suggested that it would particularly impact those living on limited means.

A particular issue raised in Port Pirie was the need to consider cultural contexts if using robots – they felt, for example, that what might be acceptable in a US context (e.g. dancing with the robot in the video) would not be generally acceptable in the Australian context.

Theme Three: Internet of Things (including smart wearables and smart homes)

In the Onkaparinga and Port Pirie World Cafés, smart wearables and smart homes were discussed in conjunction with the Internet of Things. These were discussed separately at the Playford World Café due to the number of participants at that forum, but the discussion has been merged here.

Wearable Technologies

Discussions typically centred on the potential benefits of wearables and concerns about the use of the data that they collect. Participants frequently mentioned they had and were using MedicAlerts/CareAlerts devices already – seen as one form of wearable device. Costs were also discussed, but generating a consensus that this technology should be included in aged care packages rather than being charged to users directly. The risk of technology replacing human contact was another repeated theme.

The strength of wearables

Wearables were seen to offer:

- a greater sense of security,

- safety and opportunity for independent living, whilst
- giving users greater confidence to go out of the house.

These benefits were anticipated particularly for people living alone suggesting that wearables offered opportunities for more independence and autonomy if living alone. But even when not, participants liked the idea of using wearables that would allow them to monitor their health (e.g. blood pressure or blood sugar), track and record their health activities (e.g. walking), or provide reminders such as the need take their medication or attend an appointment.

Risks associated with wearables

These positives were balanced by worries about the reliability of the technology, the risk of false alarms and, the opposite, failure to alert in an emergency. The issue of who would monitor smart wearables was raised by a number of participants, and it was noted that, in rural areas where there are significant shortages of GPs, it was unlikely that health alerts could be successfully monitored and addressed.

Reliability and system failure

Concerns about the reliability of wearables focused on uncertainty as to the transmission range within which these would function, which may undermine their capacity to alert the 'right' people (be it friends, family or ambulance) and the sentience of the device (when is an incident recognised as a critical event?).

Participants also wondered whether limited battery life could be an issue. Thinking beyond battery life, one participant asked what would happen in case of "something happening in the world" that undermined the use of technology – and people had forgotten how to function without it. The implication was that increased use of technology could be *un*abling rather than *en*abling (one participant used the example of lost cooking skills).

Wearables as cognitive challenges

Participants also considered whether wearables might be, or could become, "*too technical*" for them, building in a level of functionality that became harder and harder to understand – and to utilise. Were wearables (always) comfortable – and what happens if one forgets to wear them? Several participants remarked that they or someone they knew would not wear their device when showering (also a place where accidents are more likely to happen). One participant confirmed the associated risk with a story about a person leaving her wearable she had for emergency alerts on the kitchen table, taking a fall after getting up and then unable to call for help. Most participants agreed that these devices should be designed to be easy to use, small (a skin patch size was mentioned), durable and waterproof. A different concern raised was that we may end up with several, indeed: "*too many*" devices: "*where should we put them all?*" So that there may be a case for integrating several into an 'all-in-one device'.

Device Costs

Participants wondered about the cost of wearables. Whilst some thought that technology was getting cheaper – and would continue to get cheaper as more people were using it, one person also asked whether wearables were "*only for the wealthy*" hinting at a new form of digital divide based on affordability.

A solution was proposed to make wearables available through aged care packages on the grounds that there would be savings for the individual and the health system through use, such as fewer falls and medical incidents, fewer people needing nursing home care or deferring needing it until later in life as they are enabled to live longer in their homes.

Data (in)-security

Unauthorised data sharing was discussed at length. One table discussed that data collected in wearables might be sold to "*pharmaceutical companies*" or, someone added jokingly, "*a funeral company*" because the data contained information that could be of commercial interest to these companies. One participant suggested they would be willing to accept data security risks if it is a "*matter of life and death*", suggesting compromises on autonomy and privacy were acceptable if it meant remaining living at home or ensuring personal safety.

Participants asked whether data transmission through wearables was "safe". The issue of safety was interpreted broadly with some participants talking about the wearables themselves, whilst other were concerned about the safety of the data collected: *"It's got to be safe – who's going to use all this information?"* or as another participant expressed: *"How can they guarantee that it's going to go to who they say…all things are vulnerable".*

Loss of human contact

Several participants stressed the continued need for personal contact, with family or with friends, that wearables could potentially undermine or replace. There was a risk of loss of "*people with empathy"* as technology was taking over the communication and application of social and care functions, at a time when "*loneliness and mental illness*" were becoming more prominent. It was important to retain the "*human touch*" and "*warmth*". This was also mentioned in relation to

(hospital) treatment and (residential and/or home) care. Some participants were also anticipating fewer visits from family because technology was being perceived (by others) to replace the need for in-person contact.

Technology as social norm

Some participants noted that as individuals or as part of society as a whole, we are always adapting to technological change, just as we did to the pervasive roll out of cars or telephones in the past. Someone pointed out that "*people talk about technology as if they are scared*", but all have devices of one kind or another and we tend to "*get used to them*".

Some felt there was pressure to "*keep up with technology*", but participants did not like being pressurised into adopting technology. However, participants also recognised that, as more and more daily tasks involve technology there may be less and less choice as to whether to accept, adapt and go along, or not. One person was asking "*what's the bigger picture?"* – hinting at a 'hidden agenda' that pushes people into adopting technology. Another asked "*do we really need this?"* and one person said "*how are we going to accept it all*?" There was recognition however, that each generation feels that they cannot keep up with new advances and that their parents probably said much the same as they were saying about other, now pervasive and common devices such as the telephone, television or microwave. Some participants did note though, that the current speed of technological change and such rapid advances had not been seen before.

A number of participants across the World Café argued that society should invest more in people than technology, citing the benefits and value of the local community centre as a place to meet and socialise. In Port Pirie they noted that "*It's the human touch*" that is still so important.

Unintended consequences

Participants felt that increasing use of technology was making them/people "l*azy*" to the extent that one person suggested that "*future generations won't need to use their brains anymore"*. 'Lazy' came up as meaning both cognitive lazy (no longer thinking for ourselves) and physically lazy (no longer doing things for ourselves).

Summary on Wearables

Participants seemed to agree that smart wearables could be useful as a medical alert system or medical monitoring system. However, they had many other concerns about how this technology would be used and implemented, such as the replacement of human interaction, the cost of owning these devices, loss of privacy and loss of control over who has access to data, and whether the technology would be simple and easy to use.

Smart homes

Across the three World Cafés, there were mixed responses about the potential benefits of smart homes, with Playford and Onkaparinga generally supportive, whilst Port Pirie participants were generally skeptical of the concept. All participants expressed some degree of wariness around the concept, in particular around potential risks. Whilst the discussions primarily focused on the potential uses of smart home technology, discussions also extended into exploring some broader

issues, such as the implications of new home technology on future employment opportunities and how societal change may shape and, indeed, force the use of technology in years to come, and what this means for current and future generations learning to adapt and adopt it.

All participants had seen the introductory video presentation and needed few prompts to start the conversation, which typically built on personal observations of current and potential future uses of technology.

The practical uses of smart homes

Smart homes were seen to be useful because they had practical uses, such as reminding people to turn off kitchen equipment or take medication. People were able to relate to this especially when they were able to recall recent incidents when they had forgotten to, for instance, turn off their cooker. A number of participants saw 'bigger picture' practical benefits of smart homes, notably the technology making it more likely that older people will be able to stay in their homes for longer instead of moving into residential care or some other form of supervised co-living.

One participant living in a residential village in Playford explained that her home already had some simple design innovations, such as sliding doors or a wall oven for easier access, which she found a positive experience of "universal housing" or "sensible design". Another participant had argued that some of the technologies that were being discussed under smart homes "*should be automatically in retirement villages*". Some participants suggested that "*sensors could be a good thing*"; however, other participants had considerable concerns about their privacy and being constantly monitored: *"To me, it feels like you are being invaded"* noted one woman from Port Pirie whilst another said "*It's too impersonal – you're losing all your freedom".*

Whereas many participants did not care much about '*smarting up'* their homes now, they did note that this sense of prioritisation may change as they grow older and perhaps increasingly frail. It was therefore seen as important to take a longer term perspective and not just talk and think about the 'now' with some of these technologies. Others felt that just as people were living longer, they were also going to work longer in life, reducing opportunities and capacity to perform family care functions (generationally upwards or downwards), making everyone more reliant on technology to assist with managing personal and social care, and that this may just become a 'fact of life'. Many participants discussed "*not wanting to be a burden"* on other family members who were busy with work and other activities, and that some smart home technologies may overcome this.

Concerns about smart home technology

Participants also expressed numerous concerns about smart homes. These typically centred on aspects of the technology itself; on how it may affect the individual or shape how they live their lives, and the lives of others, such as family and friends, or society at large.

Reliability

The principal concern about reliability was, perhaps characteristically in light of South Australian experiences of a catastrophic blackout around the time of the World Cafés, shaped by worries about power loss, extended blackouts and the need for backup power to ensure consistent and

continuous utility of technology and also continuous monitoring. For instance, where the technology was to help ensure safe and healthy living in the home, reliable power sources were considered essential but not guaranteed. In Port Pirie, considerable concern was expressed about the reliability of internet and Wi-Fi access, which was often unreliable in rural areas. Some felt that people should not get "too reliant on technologies that could fail".

Inclusivity

The question of inclusiveness of technology had two aspects. First, people were weighing the promise of greater independence and ability to remain living in their own home against doubts about affordability. Not only were acquisition costs a concern, but also maintenance (what happens if the technology gets damaged or becomes outdated?) and the above-mentioned backup power costs. One suggestion to protect smart homes against power failure was to ensure they had independent solar power generation. But this, again, was seen to add to the cost of installing smart homes technology.

A second concern with respect to inclusiveness was the technology's accessibility for people with limited prior or current exposure to modern technological devices who may find it difficult to learn to program them in smart homes. This capacity to acquire new skills to operate technological equipment was not only seen as a matter of user friendliness, but also of personal dignity. On the one hand, participants acknowledged that, with ageing, it may become more difficult to learn and, importantly for some, remember how to use technology, and that extra effort may be needed to ensure that the "*brain [gets] used to new things*". This was best achieved by "*keeping things familiar and then gradually change things*", ensuring an "*evolution",* not everything "*happening overnight*". The use of acronyms in the context of modern technology was singled out as particularly challenging for some. Whilst open and even resigned to technological change, there was a concern that we should not "*make people feel useless*" if they cannot adapt speedily.

Participants not only expressed concern about the complexity of individual new devices, but also the range of such devices that could be installed in a home. Participants feared that too many devices would add to confusion. One suggestion to address this risk was to use just one integrated system or "*put all devices in one robot".*

One person also noted that opportunities for building smart homes technology may be much more limited for those in rented accommodation. While others felt that building it into new homes was more feasible than retrofitting older homes.

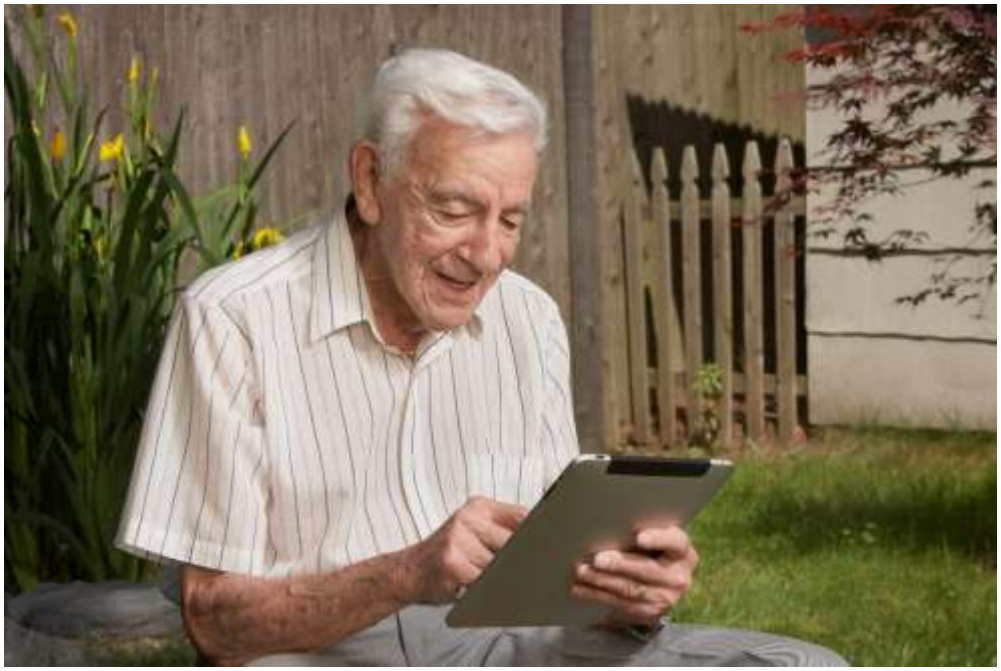
Loss of social connectedness

There was acknowledgement and familiarity from many participants who were already using smart devices such as mobile phones, Google Home or Amazon's Alexa, albeit as stand-alone technology. Despite this, and broad acknowledgement of the potential benefits of smart homes technology, there were also considerable concerns about what this type of technology could or might be expected to replace in society. For example: at one table, a long exchange developed amongst participants about how, where they lived, they and their neighbours (and family) had developed routines of looking after another, ranging from regular phone calls, sharing house keys,

informing others of temporary absences, to using the opening and closing of curtains or monitoring routines such as putting out the bins or picking up the paper from the front lawn, to signal whether someone was at home (and okay) or not. It was feared that this type of social assistance and community minded passive surveillance from friends and neighbours may be lost in a world where everyone is monitored via their smart home. Whilst less reliable (and fast responding) perhaps as smart home devices might be in case of emergencies (falls, accidents, burglaries etc.), these routines helped people retain regular contact with friends, family and communities and would be considered a loss for most participants.

Security

Security was a final concern, notably the question of data confidentiality (as participants acknowledged that smart devices collect data about the person that is accessible to others). Participants were most inclined to share smart home data with relatives, to give them *"peace of mind"* but in most cases suggested they would want the right to choose themselves who had access to their data. It was felt that smart home technology should be balanced by concerns and a desire for "*freedom and individuality".* In Port Pirie, participants noted that smart homes *"in principle sound fantastic, but with all the trouble with the internet having been pirated* [hacked]*…you can't guarantee that criminals can't get your data …you can't make it secure".* Participants were most reluctant to accept sharing of visual images (via in-home surveillance cameras) to be shared with third parties – or indeed used in smart homes at all.



Overall, participants in World Cafés had mixed opinions of smart homes. Some stated that smart appliances can be useful (such as to turn off the stove remotely) while others said that the most important thing for them was choice in what is appropriate for each individual. While a number of participants felt some aspects of smart homes and wearables could be very useful others described them as intrusive and not necessary. They recognised that different people have different ideas of what is acceptable and suggested that such systems needed to be personalised: *"you need to be able to choose what particular things might be useful for you".*

Chapter 5: Conclusion

A key finding from this research was the interest that older people expressed in finding out about new technologies and exploring the role of new technologies, both for themselves and for an ageing population more generally. They embraced the discussions with enthusiasm, clearly identifying positives and negatives, and demonstrating the ability to take a broad societal perspective on the issues as well as a personal perspective. Both the positive attributes and challenges they identified were wide ranging and well considered. The World Café approach clearly demonstrated the value of using a co-design process for technology development for an ageing population *with* that population.

Overall, there appears to be acceptance of the emerging technologies discussed. When considered in an ageing-in-place context, even monitoring and surveillance in various forms was considered an acceptable alternative to moving into residential aged care for many participants. Given that residential aged care is the costliest option for care of an increasing ageing population, it makes sense that more resources are devoted to furthering exploration of the benefits of these technologies for older people ageing in place. Future ageing could look very different if these technologies develop as rapidly as current smart technology has thus far; however, there are still a number of significant barriers to be overcome to make the technologies discussed widely available and acceptable. There was acknowledgement from many participants that this is not something they either need now, want now or is even available now. For example, general availability and use of robotics and autonomous vehicles are still considered a long way off in the future. However, many could imagine a time in the future when these technological choices may be more pertinent to their lives (as health changed and independence was challenged).

Although coming from a different perspective from the World Café participants, the Think Tank participants identified a number of issues which reflected the World Café discussions. They both noted the importance of data security and the importance of ensuring that technologies developed should be acceptable and affordable for the older people who were to use them. The data collected from the World Cafés were also highly congruent with the review of recent literature, with World Café participants voicing many similar concerns. These included key themes cutting across all forms of technology: security, autonomy and control; the potential for technology to increase isolation for older people; privacy; and issues of connectivity and affordability, as discussed in more detail below.

Security

Security of personal information represented a significant concern for participants. In particular, the security of data which would be collected in the context of wearables, the IoT, smart homes, trips and payment details in autonomous vehicles, and with assistance from robotics. A significant number of participants noted that they were concerned about who owned the data, particularly if it was to be held overseas, and also about the vulnerability of software systems to hacking. A particular concern was about how data could be exploited, e.g. being sold to pharmaceutical companies. In the rural World Café in particular, there was a high level of scepticism about the

ability (or even willingness) of the technology companies to secure personal data. Security of systems against 'crashing' or power blackouts was also raised as a concern.

Security of money was also a concern with many participants noting that they refuse to use online payment systems at all and, of those who do, several used a debit card rather than a credit card in an attempt to limit the possibility of online fraud/theft.

Autonomy and Control

Being 'in control' of any adopted technologies was identified by many participants as being very important. A number of participants said that wearables, smart houses and the IoT was "*big brother"* technology and if, for example, they didn't want to close their curtains at night they didn't want someone ringing them up to find out if they were okay! One participant said, *"It's too impersonal – you're losing all your freedom".* The issue of trust was also a significant point of discussion related to autonomy and control – trust in the actual technology itself to work (e.g. autonomous vehicles or robots) but also the ability to trust that any data collected about an individual was not used by third parties or in ways not approved by the owner.

There was a recognition, however, that there were also benefits to technology and in some instances, these could in fact provide more autonomy and independence or at the very least their usefulness would outweigh the importance of autonomy and control – specifically around support in the home and with increased frailty, either in themselves or in the people they cared for. The ability to pick and choose which specific technologies might be useful for an individual was suggested as being more acceptable, and the ability to choose your own technologies also reflected the need for continuing autonomy and the retention of some level of control. Another related theme to the issue of autonomy and control was that smart home and wearable technologies should be seen as part of a suite of care options used in conjunction with support from humans rather than *replacements* for human care.

Think Tank participants also noted the importance of ensuring that technologies were acceptable to older people, and met their specific needs and personal 'boundaries', and therefore issues of autonomy and control were seen as vital in helping to ensure such acceptability.

Social Isolation and the "Human Touch"

A recurring theme through all the World Cafés was a concern that technologies may serve to increase isolation for older people rather than enhancing their ability to age in place. All World Cafés emphasised the importance of community and social interaction, and that many of their needs were able to be addressed by their family, neighbours or their community contacts. They felt that trying to replace this with a smart home, monitoring, or a care robot was not appropriate, as they all recognised the importance of not being socially isolated as you grow older. They did however recognise that not everyone has a strong community or family to support them, and in this instance, technologies would be valuable.

The issue of "*the human touch*" was raised a number of times, related to the importance of having contact with other people. This was particularly interesting in the context of providing care. Some participants thought that robots could be very valuable in the provision of personal care – offering

privacy and autonomy - but that they could not take the place altogether of human care, as physical and social connections to others was considered vital for good health and wellbeing.

Independence versus safety

The issue of safety related not just to personal safety but, especially in the case of autonomous vehicles, to that of the wider community. In a situation where computer-driven cars are safer than those driven by humans, insurance companies may charge higher premiums for insuring cars driven by humans. There was general disbelief that autonomous vehicles will be on our roads within 15-20 years as is claimed in the video. Most World Café attendees did not think they would see these technologies in widespread usage in their life time.

Participants recognised that a number of technologies are already in place, such as robotic vacuum cleaners and many new homes have smart technology built in in terms of remotely controlled heating/cooling systems, security systems, lights and blinds. However, a number of participants were not interested in using even these simple technologies, but were keener on the very practical (from their point of view) technologies for safety that turn off stoves which have been accidently left on or that would stop a sink or bath overflowing.

Monitoring by sensors within the home in both the robotics and smart home scenarios was seen as reducing independence rather than increasing it in most cases, yet the fact that these devices enabled emergency contact with external assistance was viewed simultaneously as a positive aspect of technology. When asked '*would you accept this technology if it enabled you to stay at home rather than enter residential aged care*?' some participants were willing to accept this, but others were not.

Connectivity

Connectivity was related to affordability in some respects as many older people had limited data packages on their mobile and some had no Wi-Fi at home in favour of using free Wi-Fi in spaces like the local public library or shopping centre. In rural areas such as Port Pirie, connectivity was an even more salient issue with a lack of regional reliability of the internet and phone services, and some attendees relied on satellite connection rather than broadband.

Affordability and Cost

The costs associated with purchasing smart home equipment, robotics or using autonomous vehicles was a significant concern raised by all World Café participants. Being able to afford the equipment encompassed concerns about the initial purchase, ongoing maintenance and connectivity costs, and subsequent upgrades as the technologies improve or become outdated. Think Tank participants too, raised the key issue of cost, noting that technologies do not come cheap, and therefore consideration of issues of equity and who pays for technology need careful consideration.

Ethics

Although participants did not specifically talk about ethics, the issues which they raised reflected a number of ethical issues, particularly around privacy and the security of data. There was a general

distrust of devices such as Alexa™, Google Home™ and the Siri™ component of Apple™ products, which some participants believe actively listen to conversations in the home. The issue of not trusting technologies but being forced to use them as technology advances rapidly also has ethical implications that were discussed. Concerns about some being able to afford these advances and other not (digital divides based on affordability) were also raised.

All World Café participants expressed concern about the wider societal implications of new technologies on employment – many were concerned that things like robots would take jobs away from carers and that autonomous cars and buses would mean drivers would be unemployed. This concern about the workforce implications of technology were also discussed by the Think Tank participants – particularly the policy and industry representatives.

Policy Recommendations and Summary

Overall, the World Café methodology worked very successfully in enabling in-depth and layered discussions between older people and researchers on the sometimes quite abstract, forward thinking concepts or the complex issues associated with adopting and using technologies to support ageing in place. Researchers noted the interest and enthusiasm participants had for the study topic and their appreciation of having the opportunity to discuss the variety of issues that they recognise they will be faced with.

There are clear policy suggestions around the implementation and take up of new technologies to enable ageing in place:

- Enabling more codesign opportunities with developers of new technologies and researchers working in the fields of new technology design. A database of older people interested in trialling and reviewing new products and systems would allow government, industry and research to utilise the opinions, experiences and voices of those who are most likely to be the end users of these products. All new products and systems rolled out by providers or government should include a consultation process with older South Australians.
- More trials in living labs and demonstration sites highlighting the value of building smart homes for ageing well would allow an older population to 'try before they buy' and consider their options around moving or retrofitting technologies for greater independence as they grow older. This would enable individuals and their families to plan ahead, both in terms of what is feasible but also what is the likely cost. Independent advice should be available to older South Australians on what their options are (or will be) in retrofitting their homes with new smart home technologies and what the limitations and implications are of such systems in terms of security, safety and privacy.
- Having access to information on new technologies as they become a more ubiquitous and common component of ageing in place would enable better decision making by older South Australians. This could include hot lines, fact sheets, peer to peer training and information sessions and/or open days at living labs on a regular basis.

Based on participant feedback it is clear older South Australians involved in this study appreciated the chance to share their perceptions, thoughts and experiences around smart technologies and ageing in place. Participants were eager to take part in future research projects on this topic reflecting an ongoing interest in a rapidly developing sector which is undoubtedly going to have further impact on the lives of all Australians. In the context of ageing in place, smart technologies could have a significantly effect on the uptake of residential aged care and indeed the whole industry of caring for older Australians.

Industry representatives, technology experts and researchers were similarly enthusiatic about the opportunity to discuss the various issues from their viewpoint and in working together to address issues and develop appropriate technologies. Again, they were also very keen to pursue further research in this growing area of the development of smart technologies to support ageing in place.

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Appendices

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Appendices

Appendix B: Promotional material for the World Café sessions

Appendices

In what ways, if any, could technologies help us to live a full and rich life?

Discussion about smart technologies and ageing well
Port Pirie Council
3rd July 2019 at 9.30am,

A World Café is an opportunity for people to get together to talk about different issues that they think are important and that they would like to have more information about.

In this World Café, we would like to invite you to come and talk about the large amount of new technologies that are becoming available to help older people to live healthier lives and to stay safely at home.

We are researchers at the University of Adelaide and we would like to hear about how you use technology now, what role it plays, if any, in your daily life and how you think new technologies, like robotics or driverless cars, could support you as you get older.

We are really keen to hear about any technologies that you think would be useful for you and what you might need, not just to talk to you about what already exists. Often, technologies are developed because the developers think they will be useful, but they don't actually ask older people what they might want, and what they would find helpful!

We will introduce the World Café by providing information about the specific technologies that we would like to discuss which are:

- Using robots to assist you in your home – e.g. reminding you to take your tablets, and actually bringing those tablets to you
- Smart homes – homes that uses internet-connected devices to remotely monitor you (e.g. if you fall over) and to help manage appliances and systems, like your lighting and heating.
- Driverless cars and buses

After this information is presented, we will ask you to have discussions about these technologies with others at your table. You will get the chance to move around to different tables, so that you can talk about all 3 technologies. One of the researchers will be at each table to take notes about your discussions and the things you think are important and the technologies that you think might be helpful. We're also interested in the technologies you don't think are helpful and what you see as particular issues associated with these technologies.

We'll stop for lunch after the morning discussions and the researchers will get together to combine all the discussions and summarise the issues that you raise.

After lunch we will present back to you the summary of the morning discussions and then we'll have an open discussion about the issues and ideas that you have identified.

We hope that you will be able to help us with this important research.

If you would like more information about this project, please contact **Dr Teresa Burgess** at the University of Adelaide on **0424 586 826** or Teresa.burgess@adelaide.edu.au

Appendices

Discussion about smart technologies and ageing well

City of Playford,

4th July 2019 at 10.30am,

The City of Playford, the Office for Ageing Well and the University of Adelaide would like to invite you to attend a discussion about how new 'smart technologies' may, or may not, help you to age well.

Increasingly, technological solutions such as personal surveillance and monitoring, driverless cars or robotics are suggested as smart solutions for ageing societies. Often these ideas are driven by developers of technologies or by policy makers, who can see such technologies as helping people as they age. However, these ideas often overlook the social and ethical challenges such technologies may create for older people.

So, we want to hear from you – the true experts on ageing well - about how you use technology now, what role it plays, if any, in your daily life and how you think new technologies, like robotics or driverless cars, could support you as you age. What is it that you value most when ageing and what is the potential role or place of new technologies to these values and priorities?

We would like you to be part of an interactive, informal discussion which uses the World Café format to discuss some of these ideas. You can read about the World Café here: http://www.theworldcafe.com/key-concepts-resources/world-cafe-method/

A light lunch, tea and coffee will be provided on the day – all we need you to bring is your opinions, experiences and ideas!

If you come along to a World Café you can go into the draw for a $100 Coles-Myer voucher.

If you would like more information about this project, and how you can be involved please feel free to contact the project research team at the University of Adelaide or speak to a contact at the City of Playford.

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Appendices

Appendix C: Example of World Café schedule

World Café Schedule Example (Playford)

Time (mins)	Activity	Logistics
10.30am (15 mins)	Meet and greet, ask participants to choose a table Meet table hosts and scribes	Name tags with first names for all 4 tables with names: • The internet of things (wearables and smart homes) x 2 • Autonomous vehicles • Robotics
10.45am (15 mins)	The host will introduce themselves and the concept and conduct of a World Café. Facilitator will explain the timetable for the morning and that participants can get up at any time to get food/drink etc. Point out loos and exits etc.	Ground rules shared. The topics will be briefly introduced The Project Team will be introduced and they can be called to the table to answer brief questions but also questions can be asked in the breaks. Table paper/ post-it notes/ pens on the tables so people can write on the table paper
11am (30 mins)	Facilitator or another researchers will talk briefly about the technology areas	Videos shown at this point
11.30am. (20 mins)	Session 1: Discussion at the tables	Hosts stay at the same table. Post it notes with major themes placed on wall.
11.50am (20 mins)	Session 2: Discussion at the tables	Hosts stay at the same table. Host/scribe give brief explanation of the key points raised by the last group. Post it notes with major themes placed on wall.
12.10pm (5 mins)	Break and change tables	
12.15mid (20 mins)	Session 3: Discussion at the tables	Hosts stay at the same table. Host/scribe give brief explanation of the key points raised by the last group. Post it notes with major themes placed on wall.
12.35pm (25 mins)	Session 4: Discussion at the tables	Hosts stay at the same table. Host/scribe give brief explanation of the key points raised by the last group. Post it notes with major themes placed on wall.
1pm (30 mins)	**Lunch**	
1.30pm (45 mins)	General discussion under direction of facilitator. Sharing ideas which are recorded on white boards	Scribes work to draw the information together in themes within and across categories and raise themes which emerged at the tables but which are not included in the general discussion.
2.15pm (15 mins)	Feedback session in small groups	Did they like the World Café format? Why/Why not? Is the length sufficient? What helps and what hinders the conversation? Did the participants feel that they had the opportunity to have their say? Did they find the videos useful? What else would they have liked to know?
2.30pm	**Finish**	