SHAPING AGED CARE WORK THROUGH TECHNOLOGY: A SENIOR MANAGER AFFORDANCE PERSPECTIVE

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Abstract

The Australian aged care sector is under increasing pressure to respond to an ageing population, fears about the quality of care provided to them, concerns about the financial viability of aged care providers, and increasing workforce and skills shortages in the sector. The Australian government and industry stakeholders are increasingly considering technology as a potential solution to these challenges. Research, however, highlights potential risks of integrating technology in the care of older people and possible adverse impacts on the humanistic work environment of aged care. As key decision-makers in technology investment, senior managers working in aged care exert a strong influence over how technology is integrated into the work environment. Yet little is known of the possibilities they perceive for technology in supporting the humanistic nature of aged care work.

This study addresses the gap in knowledge by conducting interviews with senior managers from a large Australian aged care provider (the provider) as well as a sample from the aged care technology industry (the industry). The question was asked: *From the perspective of senior managers, how is the introduction of technology into aged care shaping the work environment?* Interviews provided insights into the current technology used within aged care, key drivers of technology investment, and considerations for future technology. Adopting the theoretical lens of Affordance Theory (Gibson, 2014), the study identifies eleven (11) perceived affordances, or possibilities, senior managers have of technology that facilitate the delivery of aged care services, and three (3) expected outcomes in the longer-term.

By exploring the dynamics between affordance realisation, investment drivers and expected outcomes, findings show that technology has shaped aged care in several

significant ways. Mobile technologies have disrupted communication and collaboration methods within the work environment, raising the importance of human connection in community care. Investment in technology in the sector is currently stalled, with potential negative consequences for the sector's ability to innovate into the future. A key driver of technology investment has been a short-term focus on organisational efficiency gains which outweigh a longer-term focus on the quality of care services. This focus on work-efficiency has overshadowed investment in technologies that would attract new workers to the sector. Despite the relatively small impact on the work environment experienced to date, the planned technology adoption to support work tasks will create a 'skills tension' for workers as their roles evolve to require greater use of technology.

Implications of this study are significant for government and aged care organisations, and valuable for technology developers. Findings suggest the need for policymakers to acknowledge the limited technical agility of providers to adapt to new processes quickly, for training providers to develop new skills needed in the aged care work environment, and for government to review sector-wide workforce attraction strategies. For aged care organisations, greater focus is required on person-centred care when adopting technology by having a longer-term perspective and considering non-financial aspects within technology business cases. Findings also indicate that building an engaged workforce within aged care providers requires clear communication, strong leadership, and tailored workforce training programs that ensure technology does not negatively affect relationships with older people. Finally, the affordances identified in the study provide technology developers with the guidance of senior manager expectations of technology in enhancing care quality for older people.

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List of Abbreviations

AACTC	Australian Aged Care Technologies Collaborative
ABS	Australian Bureau of Statistics
ACFA	Aged Care Financing Authority
ACFI	Aged Care Financing Instrument
ACIITC	Aged Care Industry Information Technology Council
AI	Artificial Intelligence
CDC	Consumer Directed Care
COWS	Computers on Wheels
CRC	Cooperative Research Centre
GDP	Gross Domestic Product
GP	General Practitioner
HR	Human Resources
IT	Information Technology
NDIS	National Disability Insurance Scheme
NFP	Not-for-Profit
OECD	Organisation for Economic Co-operation and Development
OT	Occupational Therapist
QUT	Queensland University of Technology
RAG	Research Approval Group

RN   Registered Nurse

SACWIC   Support for Aged Care Workers in COVID-19

VR   Virtual Reality

WHO   World Health Organisation

Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature: QUT Verified Signature

Date: 8th March 2021

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Chapter 1: Introduction

With an ageing population, fears of poor-quality care being provided to older people, and limited financial and human resources, Australia's aged care sector is under pressure to adapt its service delivery model. Information and communication technology (hereafter, technology) is any product that will store, retrieve, manipulate, transmit, or receive information electronically in a digital form (Information and communications technology, 2021). It is increasingly viewed as a way to improve the care of older people and maintain or maximise organisational productivity. However, technology has been found to have adverse impacts on the humanistic environment of aged care work. It can influence, in unintended ways, organisational culture and decisions that workers make. Little is known about the expectations that senior managers, as the key decision-makers of technology investment, have of technology. This study explores the dynamics of technology adoption in the aged care work environment from the perspective of these managers.

This introductory chapter outlines the context and key considerations that contributed to the design of the study by covering the background, research aims and objectives, significance, and thesis outline.

Background

Australia is facing increasing societal, economic, structural and workforce challenges in the care of its older people. The sector is experiencing mounting pressure for radical change to support the fastest-growing age bracket of Australia's population – people aged over 65 years. Forecasts indicate this demographic of the total population will increase from 15% in 2017 to 23% by 2066 (Australian Bureau of Statistics, 2017). The sector is structured to include government, not-for-profit (NFP),

and for-profit organisations that provide care in an older person's home (community aged care), or in an aged care facility (residential aged care). Over the past two decades, government reforms have focussed on innovation to deliver person-centred services (Parkinson & Radford, 2019). This includes supporting people to live in their homes longer by accessing community care services and encouraging a wellness and reablement approach. Greater use of technology in the sector is also encouraged as a way of innovating practices (Aged Care Workforce Strategy Taskforce, 2018, p. 95; Royal Commission into Aged Care Quality and Safety, 2020a, p. 34), and has led the Australian Government to establish the *Australian Digital Health Agency* to encourage greater use of technology across the health sector.

The heavily regulated aged care sector is primarily funded by the Australian Government, with estimated expenditure in 2018/19 of $20.1 billion, projected to increase to $25 billion by 2022/23 (Aged Care Financing Authority (ACFA), 2020; Steering Committee for the Review of Government Service Provision, 2020). In addition, older people are estimated to have spent $5.1 billion in 2018/19 on everyday living expenses in residential facilities (Aged Care Financing Authority (ACFA), 2020). As an industry, aged care makes a significant contribution to the Australian economy, representing more than one per cent of Australia's Gross Domestic Product (GDP) (Aged Care Financing Authority (ACFA), 2020).

In 2019, government funding supported 1.3 million people in Australia to receive subsidised services from three programs (Aged Care Financing Authority (ACFA), 2020). Two of these programs were designed to support people in their homes, and the third in residential facilities. Over 3,000 aged care providers (providers) received this funding, with the majority being NFP providers that deliver both community and residential care (Aged Care Financing Authority (ACFA), 2020). Recent government

reforms have required greater transparency of information for older people making decisions to enter care arrangements. The sector is now described as a "more consumer-driven, market-based system" with increased competitive pressures on and between providers (Aged Care Financing Authority (ACFA), 2020; IBISWorld, 2018). Nevertheless, 60% of aged care providers are not financially sustainable (StewartBrown, 2020), highlighting the underlying financial pressures within the sector.

Aged care providers are encountering workforce shortages, negative perceptions of working in aged care, and shifting job capability needs of workers. Over 366,000 people were employed in the sector in 2018, representing 3% of Australia's total working population (Aged Care Workforce Strategy Taskforce, 2018). However, industry analysts estimate that an additional 25,000 workers are required in Australia each year to meet the increased demand for services (McCrindle, 2017) and to replace those retiring from the workforce (Mavromaras et al., 2017). Perceptions that associate aged care with "dirty work", and increased workloads continue to impact negatively on the ability to attract and retain workers to the sector (Banks, 2018; Mavromaras et al., 2017; OECD, 2020; Ostaszkiewicz et al., 2016). Furthermore, workforce challenges from the increased use of technology within the sector have highlighted the need for further investment in workers' skills (Aged Care Industry Information Technology Council (ACIITC), 2018; Priddis et al., 2020).

In 2018, increasing public attention and growing concerns about the quality of aged care led the Australian Government to initiate the 'Royal Commission into Aged Care Quality and Safety' (Royal Commission). Interim findings describe "harrowing evidence of the experiences of people caught in aged care systems" (Royal Commission into Aged Care Quality Safety, 2019, p. 255). Hearings also found a

sector focussed on transactions instead of relationships, and a workforce under pressure, unappreciated and lacking key systems. As part of the Royal Commission's final submissions, the increased use of technology was signalled as a solution to the challenges of the sector (Royal Commission into Aged Care Quality and Safety, 2020b; Royal Commission into Aged Care Quality Safety, 2020) with technology utilisation viewed as a way of supporting aged care services to be more sustainable and innovative (Royal Commission into Aged Care Quality and Safety, 2020a, pp. 43, 256). In this way, technology was seen to address some of the public's concerns about the quality of aged care in Australia.

Beyond aged care, Australia is experiencing a rapid evolution of technology use. This progression is putting organisations and policymakers under increased pressure to meet changing expectations associated with technology use in society (Yongxin et al., 2018). Common reasons for technology investment include workforce productivity improvements, reduction of costs, and improvements to the customer experience (IBISWorld, 2018; Lai et al., 2018). This has resulted in pressure on organisational decision-makers to incorporate digital solutions as key initiatives to achieve organisational goals.

For aged care providers, technology has been found to deliver benefits to support healthy ageing. Older people appear to respond positively to a range of technologies for their psychological care including health-care robots, robotic animals, iPads and web-based applications, online healthcare portals, and Virtual Reality (VR) (Banks et al., 2008; Broadbent et al., 2012; Kanamori et al., 2002; Rehm et al., 2016). Maintaining their physiological health using technology has also received positive responses (Soro et al., 2017). However, several unintended consequences and ethical risks of technology adoption have also been identified. After losing human connection,

older people have raised concerns that technology is being introduced as a replacement for human care, resulting in their non-acceptance of the technology being implemented (Broadbent et al., 2012). Studies have also found they become over-dependent, de-skilled and disempowered from relying on technology (Soro et al., 2017; Wilson, 2018). They are also deprived of their liberty and the privacy of their data (Sharkey & Sharkey, 2012). Thus, when adopting technology to support the healthy ageing of older people, senior managers must balance the demand for innovation against these potential threats.

The pace of technological change has facilitated opportunities for aged care providers to improve workforce productivity. For example, efficiency gains have resulted from telehealth remote care via video-conference technologies, electronic rostering and financial management, electronic care management, and electronic medication administration systems (Buntin et al., 2011; IBISWorld, 2018; OECD, 2020; Zhang et al., 2012). Providers are also able to deliver care services to an increasing number of older people with the existing number of workers by augmenting workers with technology or replacing administrative tasks with process automation (OECD, 2020; Priddis et al., 2020). However, providers must consider the intimate and physical nature of care that requires high levels of interpersonal interaction that adds layers of complexity to aged care work (James, 1992, p. 503). The considerable time and expertise needed for workers to develop relationships with older people can make it difficult for providers to address workforce productivity issues in relation to the emotional demands on workers (Meagher et al., 2019). As a result, when improving workforce productivity through technology, senior managers must consider the humanistic nature of care work.

The rapid evolution of technology and the potential adverse impacts of technology adoption have led to calls for further studies into the impact of technology on workplaces. Research is needed to understand how technology is impacting the humanistic work environment of aged care service delivery so that opportunities and risks to the provision of person-centred care are clearly understood (Barnes, 2012; Kapadia et al., 2015; Mohsen et al., 2019; Wang et al., 2020). Senior managers are the key decision-makers of technology investment, yet, comparatively little is known about their considerations or intentions when adopting technology in an aged care work environment (Bharadwaj et al., 2013; Eden & Burton-Jones, 2018; Fleming et al., 2018; Killett et al., 2014). By understanding the opportunities and risks of technology in aged care work and senior manager intentions for technology adoption, the potential adverse impacts of technology can be minimised.

Given the humanistic nature of care, it is important to gain an insight into the potential impact of senior manager investment in technology on the future aged care work environment. Prior studies have highlighted the potential dehumanisation of work from new technologies that have altered communication methods (Barnes, 2012; Sävenstedt et al., 2006). Technology adoption has also been shown to have adversely impacted organisational culture (Eden & Burton-Jones, 2018; Fleming et al., 2018; Killett et al., 2014), and unintentionally altered existing relationships between workers, managers and older people (Wu, 2020). Within aged care, calls have been made to understand the impact on relationships and collaboration (Mohsen et al., 2019; Wang et al., 2020) and how the dynamics of work and workplaces are shifting as a result of technology (Barnes, 2012; Kapadia et al., 2015; Mohsen et al., 2019). With providers facing significant financial pressures and workforce challenges, it is possible that senior managers are focussed on improving the efficiency of care delivery rather

than improving the quality of care. Gaining an insight into senior managers' affordances, or possible uses, of technology will help identify risks which may adversely impact the humanistic nature of aged care work.

Research Aims and Objectives

From the perspective of senior managers who are making strategic decisions about technology adoption, this study aims to understand how technology is shaping the aged care work environment. By interviewing Executives and Directors from a large Australian aged care provider, an aged care industry body, and an aged care technology developer, a deeper understanding will be gained of the internal and external influences on senior manager decision making. This will generate new knowledge of the nuances of senior manager decision making concerning technology (Marshall et al., 2013; Yin, 2018).

As well as posing and seeking answers to the research question: *From the perspective of senior managers, how is the introduction of technology into aged care shaping the work environment?* an objective of this study will be to analyse the use of technologies through the following sub questions:

1. *What technologies are being implemented in aged care?*
2. *How are decisions to adopt these technologies influenced by the internal and external aged care context?*
3. *What are the perceived affordances provided by technology to senior managers and have these been realised?*

Significance of the Study

Despite considerable pressure across the sector to invest in technology to improve the quality of aged care, there is little research that examines how technology is holistically impacting the aged care work environment. This study will provide an

insight into how senior managers perceive this impact and generate new knowledge as to the extent their goals align with government expectations of innovative technology adoption. This knowledge is essential to understanding the capability of aged care providers in their support of the government's *Aged Care Workforce Strategy* (Aged Care Workforce Strategy Taskforce, 2018) and the *Aged Care Workforce Industry Council* in their direction of appropriate resources to workforce initiatives. With the imminent release of the findings from the Royal Commission, policymakers will have access to empirical evidence about the sensitivity and impact of technology-related recommendations on providers within the sector.

As well as uncovering perspectives on potential risks such as decreasing employee engagement or lack of technology acceptance in response to technological change (Bloomfield et al., 2010; Kapadia et al., 2015; Shulzhenko & Holmgren, 2020), this study will allow providers to consider how technology can be leveraged to retain and develop an engaged workforce in an increasingly competitive market (Højlund & Villadsen, 2020). It will also allow for an assessment of the internal and external drivers of technology investment and how this relates to the organisational goal of person-centred care delivery (Bharadwaj et al., 2013). Aged care workers and the older people they support may also benefit from evidence of how organisations are making decisions to invest in technology, and the extent to which the humanistic work environment is being considered (Cavenett et al., 2018; Wang et al., 2020).

By exploring senior manager affordances of technology in the work environment, the study will provide empirical evidence into how the future workplace is being shaped by aged care providers and whether this meets the expectations of society (Fleming et al., 2018). Perceptions will be analysed by applying Gibson's affordance theory (Gibson, 2014) to define the possible uses a person has for an object

such as technology. Although affordance theory is often used to gain knowledge into the techno-social interactions within an organisational context (Orlikowski & Barley, 2001), the current study will focus on the under-examined perspectives of 'senior managers'. This perspective is important because technology investment decisions sit with this layer of the organisation. This viewpoint also benefits technology developers who can utilise the affordances as a 'user-centred' list of technology requirements (Gaver, 1991). The research will also contribute to theory development by demonstrating how affordances are realised (or not) through technology adoption, and the extent to which internal and external pressures on senior managers influence technology realisation (Strong et al., 2014). Rather than the more normative approach of focussing on one technology solution or one functional process within an organisation, the study will take a technology-agnostic view across the whole workforce. By doing so, this study will uncover how technology is holistically impacting the work environment and further extend the use of affordance theory.

Thesis Outline

A literature review in **Chapter 2** describes the Australian aged care sector, synthesises extant research regarding the use of technology in aged care, and introduces the concept of affordances as the theoretical lens used to examine the data (Gibson, 2014). Research gaps and questions are summarised. **Chapter 3** details the design and methods used in the study. **Chapter 4** presents research findings generated via interviews with senior managers, in particular the identification of senior manager affordances of technology in the aged care work environment. **Chapter 5** discusses significant ways in which technology is shaping the aged care work environment and identifies practical and theoretical contributions of the study. The chapter concludes with a discussion of the limitations of the study and an agenda for future research.

Chapter 2: Literature Review

Introduction

This literature review presents a snapshot of the Australian aged care sector's structure, funding arrangements, and workforce characteristics. Government policy and sector challenges and organisational responses to these challenges are then described. The substantive component of the review synthesises the extant research into the use of technology in caring for older people and technological considerations for the aged care workforce. Affordance Theory is explained as the lens for studying technology in the aged care sector. This is followed by a summary of the research gaps and research questions for this study.

The Australian Aged Care Sector

The Australian aged care sector is experiencing increasing pressure for radical change to support the fastest-growing age bracket of Australia's population. With the proportion of Australian's aged over 65 years estimated at over 3.8 million people (or 15% of the total population) in 2017 (Australian Institute of Health and Welfare, 2018), the sector is preparing to support a predicted population, by 2066, of up to 23% of people aged over 65 (Australian Bureau of Statistics, 2017). It is anticipated that the number of Australians over 85 years will increase significantly from 497,000 (13% of those over 65) in 2017 to 1.5 million (20% of those over 65) by 2047 (Australian Institute of Health and Welfare, 2018). Currently, the proportion of older people over 85 receiving aged care services is three times higher than for those aged 70 and over (Aged Care Financing Authority (ACFA), 2020).

Australia's ageing population challenge is being similarly experienced in many industrialised economies globally. Predictions indicate that the proportion of the

world's population over 60 years will rise from 12% to 22% between 2015 and 2050 (World Health Organization, 2018). To tackle this challenge, the World Health organisation (WHO) has initiated a focus on "healthy ageing", which is defined as "the process of developing and maintaining the functional ability that enables well-being in older age" (2015, p. 28). Priority action areas include ensuring a sustainable and appropriately trained workforce (2015, p. 212) and the integration of health technology products and services into national policies (2015, p. 111).

Structure of the Aged Care Sector

In Australia, aged care services are provided by the government, not-for-profit (NFP), and for-profit organisations in either an older person's home (community aged care) or within an aged care facility (residential aged care). The Australian Government, which funds most of the sector, has signalled a preference for community over residential care by increasing the number of operational places funded for community care relative to residential care. The percentage of funded residential places has dropped from 76% in 2012 to 62% in 2021/22, while community care places increased from 24% to approximately 36% (Aged Care Financing Authority (ACFA), 2020).

There are over 3,000 aged care providers (providers) in Australia receiving government funding for aged care services. Of these, 73% receive funding through one of three funding programs (home support, home care, or residential care) (Aged Care Financing Authority (ACFA), 2020). The remainder receive funding from two or more of these government funding programs. Within the residential care market, although there are no organisations that hold more than 5% of the market, this number is anticipated to change over the coming years as organisations gain greater scale (Richardson, 2020, p. 37). In 2019, most organisations receiving government funding

were NFP providers which delivered both community and residential care (Aged Care Financing Authority (ACFA), 2020).

With the introduction of government reforms over the past two decades (refer Government Policy Responses to Challenges in Aged Care below), the sector now provides greater transparency of information. Thus, older people are more informed when making decisions about using aged care service providers. This has led to the evolution of a "more consumer-driven, market-based system" with increased competitive pressures on and between providers (Aged Care Financing Authority (ACFA), 2019; IBISWorld, 2018).

Funding for Aged Care

Although there has been a shift towards consumer-driven aged care services, the sector remains heavily regulated and reliant on government funding. Over the past 100 years, the responsibility for aged care has evolved from Local and State governments to the Australian Government. In 2019, 1.3 million people in Australia received aged care services subsidised by the Australian Government, with 1.2 million of these people receiving funding from one of the three government programs (Aged Care Financing Authority (ACFA), 2020). The number of subsidised services is expected to increase to 1.5 million people by 2022-23 (Aged Care Financing Authority (ACFA), 2020).

Although service providers charge fees to older people, services are primarily funded by the Australian Government which in 2018/19 funded 98.2% of the total government expenditure of $20.1 billion (the remaining was covered by State and Territory governments) (Steering Committee for the Review of Government Service Provision, 2020, p. 14.13). This funding is projected to increase to $25 billion by 2022/23 (Aged Care Financing Authority (ACFA), 2020). In addition to government

funding, it was estimated that older people spent approximately \$5.1 billion in 2018/19, excluding refundable accommodation deposits, with two-thirds being spent on everyday living expenses within residential facilities (Aged Care Financing Authority (ACFA), 2020). Despite this financial support, 60% of aged care providers are not financially sustainable (StewartBrown, 2020), highlighting the underlying financial pressures which are likely to have a strong influence on the future strategic and investment decisions of senior managers within the sector.

Aged Care Workforce

Over 366,000 people are employed in the aged care sector, representing 3% of Australia's total working population (Aged Care Workforce Strategy Taskforce, 2018). An additional 68,000 volunteers (Mavromaras et al., 2017), and approximately one million informal carers (carers providing services for older people outside of a provider and who receive a Carers Payment) support the delivery of aged care services (Australian Institute of Health and Welfare, 2019, p. 182).

The 2016 Aged Care Census revealed the average frontline aged care worker is female, in good health, and holds a Certificate III qualification. However, with an average working age of 48 in residential care and 52 in community care, aged care workers are older than the national average for workers (Mavromaras et al., 2017). This is of concern as Australia has an aged care workforce who will be retiring at the same time as demand for care services increases. Providers and Government policymakers are aware of this issue and are considering technology as a way of augmenting or replacing workers.

The training of workers is a responsibility shared by government which designs training packages, in consultation with industry and providers which are expected to adhere to minimum qualification requirements and invest in the ongoing training of

workers. Despite Australia being one of the few Organisation for Economic Co-operation and Development (OECD) countries that provide qualifications in aged care (OECD, 2020, p. 25), reports indicate that, potentially due to funding constraints, the workforce does not appear to be upskilling to the extent expected (StewartBrown, 2020). To fulfil demand, a sizeable proportion of workers are overseas-born with around a third of residential personal care workers residing in Australia for fewer than 5 years (Mavromaras et al., 2017, p. 76). The largest percentage of migrants in recent years has come from South Asia and sub-Saharan Africa, resulting in potential cultural and language barriers to training (Adamson et al., 2017; Negin et al., 2016).

Aged Care Challenges

Within the Australian aged care sector, numerous challenges have emerged in recent years including the adaptation to shifting models of care; concerns about the financial viability and sustainability of providers; and workforce shortages and shifting capability needs.

Shifting Models of Care

The quality of care continues to be a key focus of aged care reform, with an emphasis on innovation to deliver person-centred services to older people in the low-resourced sector (Parkinson & Radford, 2019). This includes a focus on supporting people in their homes longer and encouraging a wellness and reablement approach to providing aged care services. This approach focusses on identifying the goals of the older person, as well as helping them to regain physical function and independence. Although there is strong support for implementing a reablement approach (OECD, 2020, p. 29) aligned with the WHO's focus on promoting capacity-enhancing behaviours (World Health Organization, 2015, p. 212), it is not embedded across the sector (Nous Group, 2018). The government has also drawn criticism for the lack of

funding allocated specifically to improve the quality of care through reablement (Fine, 2020). Considering the heavy reliance on government funding within the sector, providers are being encouraged to explore alternative innovations for changing models of care (Royal Commission into Aged Care Quality Safety, 2020).

Financial Viability and Sustainability

Senior managers within aged care have been navigating financial viability and sustainability issues for several years. For residential care providers in particular, the Aged Care Financing Authority (ACFA) highlighted that changes to the Aged Care Funding Instrument (ACFI) in 2016 and 2017 "constrained growth in providers revenue below growth in costs, particularly staff costs" (Aged Care Financing Authority (ACFA), 2020, p. v). For the nine months to March 2020, 60% of residential providers were operating at a loss with revenue not covering direct and indirect costs of care services (StewartBrown, 2020). Rural and remote residential homes were particularly vulnerable, with an average operating loss nearly double the sector average (StewartBrown, 2020, p. 9).

Providers of community care services continue to adjust to the February 2017 introduction of consumer directed care (CDC) funding. This reform allowed older people to select and change their provider, resulting in increased visibility of community care providers and increased competition (Aged Care Financing Authority (ACFA), 2020). Providers appeared to be achieving positive operating results, however, reports for the nine months to March 2020 indicated continued underspending by older people of Home Care Package funds (StewartBrown, 2020). Early predictions of the impact of the COVID-19 pandemic that impacted Australia heavily in 2020 suggest further under-spending with many clients in community care cancelling services during the pandemic (StewartBrown, 2020). The impacts of

COVID-19 on the financial sustainability of residential providers remains unknown. However, the Australian Government released several financial assistance packages designed to assist the sector. These included a one-off grant of $900 per bed and $1,350 per bed for regional aged care homes; an *Aged Care Support Program* to reimburse aged care providers that were directly impacted by COVID-19; and specific funding to eligible providers for additional costs to support eligible workers under the Support for Aged Care Workers in COVID-19 (SACWIC) (Australian Government Department of Health, 2020). In addition, a workforce retention bonus (March 2020), funds to upskill and hire workers (May 2020), and changes to work visas (September 2020) were offered to providers as short-term solutions.

Workforce Shortages and Shifting Capability Needs

The sustainability of the aged care workforce faces several challenges. Across the sector, aged care providers encounter workforce shortages, negative perceptions of working in aged care, and shifting capability needs. Industry analysts estimated that an additional 25,000 new aged care workers are required in Australia each year to meet the increased demand for services (McCrindle, 2017). Additional pressure on the Australian aged care workforce has resulted from the introduction of the National Disability Insurance Scheme (NDIS) that relies heavily on personal care workers who hold suitable skills for both sectors (Department of Education Skills and Employment, 2019).

Negative perceptions of aged care work and increased workloads on workers continue to impact the ability to attract and retain workers (Aged Care Financing Authority (ACFA), 2020; Banks, 2018; Mavromaras et al., 2017; OECD, 2020; Ostaszkiewicz et al., 2016). Ostaszkiewicz et al. (2016) identified the "taint" associated with "dirty work" in aged care. Recent research by Clarke and Ravenswood

(2019) identified the importance of career identity to overcome negative perceptions of aged care work. Community workers value the flexibility of the job while residential workers value support where it is available and also a comfortable work environment (George et al., 2017, p. 1021). However, the ongoing stigma of aged care work remains a challenge for senior managers who wish to attract new workers into the sector to increase the size of the workforce (Fanning et al., 2020).

Another key workforce challenge is the investment required to increase the technological skills of workers. Changes in care delivery in recent years and the increased use of technology point to the need for further investment in workers' skills. By 2035, Australian Registered Nurses (RNs) and Aged and Disability Carers are forecast to have, respectively, 52% and 38% of their roles augmented with technology, while 8% of Aged and Disability Carer roles are expected to be completely automated (Priddis et al., 2020, p. 46). A collaboration of industry bodies recommended five priorities in technology for the aged care industry including building a "technology-literate and enabled workforce" (Aged Care Industry Information Technology Council (ACIITC), 2018, pp. 7, 9, 39). Although improvements have been identified, a digital divide persists between people who are and who are not technology-literate due to education and economic barriers (OECD, 2020; Thomas et al., 2020; Williamson et al., 2015). Their demographic and economic profile of being lowly paid makes aged care workers especially vulnerable to a skills shortfall. This raises concerns about the absence of sector-wide training and the need for working in a technology-driven world (Aged Care Industry Information Technology Council (ACIITC), 2018, pp. 7, 9, 39), and provides a strong imperative for providers to invest in new workforce development strategies outside of the traditional training qualification approach (National Centre for Vocational Education Research, 2020).

Government Policy Responses to Challenges in Aged Care

The issues canvassed above demonstrate that the Australian aged care sector has been and is currently under significant pressure to reform the structure and funding of services. Over the past two decades, since the introduction of the *Aged Care Act 1997 (Cth),* the Australian Government has attempted to respond to changing demographic and economic conditions. In 2016, the Government released the *Aged Care Roadmap* to guide the creation of a consumer-driven aged care market. Initiatives that followed included the establishment of the *Aged Care Quality and Safety Commission* which introduced a mandatory charter, standards and performance indicator reporting from 1 July 2019, and the *Aged Care Quality Standards* which consolidated the accreditation and quality requirements for providers into one set of quality standards. The government-led Aged Care Workforce Strategy Taskforce also delivered a national workforce strategy entitled *A Matter of Care: Australia's Aged Care Workforce Strategy* (Aged Care Workforce Strategy Taskforce, 2018) which emphasised the quality care agenda. This strategy was supported by the Australian Government, and the implementation is now being overseen by the recently established Aged Care Workforce Industry Council. Alongside the strategies above, the Australian Government established the *Australian Digital Health Agency* to operate a national digital healthcare system and lead the health system to adopt digital technology.

Despite the evolution of the aged care sector, increasing public attention and growing concerns about the quality of aged care in Australia led the Australian Government to initiate the 'Royal Commission into Aged Care Quality and Safety' (Royal Commission) in 2018. The Interim Report of findings issued by the Royal Commission, entitled *Neglect* describes "harrowing evidence of the experiences of people caught in aged care systems" (Royal Commission into Aged Care Quality

Safety, 2019, p. 255). The report also set priorities for further investigation, including the problem of a system "designed around transactions, not relationships or care" and a workforce that is "under pressure, under-appreciated and lacks key systems" (Royal Commission into Aged Care Quality Safety, 2019, p. 255). Increased use of technology to deliver aged care services more sustainably and provide innovative responses to the challenges in the sector was also signalled (Royal Commission into Aged Care Quality and Safety, 2020b; Royal Commission into Aged Care Quality Safety, 2020). The final report of the Royal Commission is anticipated to be released in 2021.

Aged Care Provider Responses to Challenges in Aged Care

As well as shifting models of care, financial strain and workforce challenges, aged care providers are under pressure to respond to changing customer expectations and the scrutiny of the Royal Commission. The nature of care also adds further complexity for providers with work requiring high levels of interpersonal interaction and significant emotional demands (Meagher et al., 2019; Oppert et al., 2018). This can be difficult to manage alongside pressures to improve workforce productivity. With research indicating a significant positive relationship between worker satisfaction and aged care resident satisfaction (Chou et al., 2003), it remains important for providers to be sensitive to the demands and pressures on aged workers and the potential impact on older people.

Australia has improved its aged care workforce productivity in a range of ways including the use of telehealth remote care, and by training personal care workers to assist with medicine management that was once the province of nurses (OECD, 2020, p. 11). However, with the challenges referred to above, providers are increasingly looking to technology to enhance workforce productivity further. By using technology to augment the tasks undertaken by workers, or replace workers, organisations may be

able to provide care services to an increased number of older people with the same number of workers whilst also allowing workers to focus on providing a better quality of care (OECD, 2020, p. 161). With a high concentration of technologies available to the sector and low barriers to entry, there is potential for widespread innovation across the industry (Richardson, 2020, pp. 43-44).

Despite the growing emphasis on technology in health and aged care, there is currently a limited understanding of how technology is impacting the humanistic work environment of aged care and the delivery of aged care services. In community care, the "work environment" is also the older person's "home", adding further complexity to the deployment of technology in these settings (Cavenett et al., 2018, p. 200).

Technology and Aged Care

Rapid technological change is being experienced across industries and organisations and the aged care sector is no exception. Workforce productivity improvements, cost reduction and improving customer experience are commonly cited as key reasons for investment in technology (IBISWorld, 2018; Lai et al., 2018). With resulting lower prices, increased performance levels, and global connectivity, organisations have adapted their business infrastructure and operating models to meet new strategic goals through technology (Bharadwaj et al., 2013). This has led to the observation that humans may now be entering a "Fourth Industrial Revolution" (Schwab, 2016). Such a 'revolution', however, comes with risks as well as opportunities. With technology able to be deployed around the world within days, organisations and policymakers need to be agile in responding to changing expectations associated with technology in society (Yongxin et al., 2018).

Technology and Older People Requiring Care

Technology can improve the quality of care provided to older people. Collaborations, such as the recently established Australian Aged Care Technologies Collaborative (AACTC) through the Menzies Health Institute Queensland, the Care-IT project developed by the Aged Care Industry Information Technology Council (ACIITC), and the Digital Health Cooperative Research Centre (CRC), seek to further research and develop ways to improve the quality of care for older people through technology. This adds to the many research studies conducted to date to improve the quality of life for older people outlined below.

Much of the research into the use of technology in aged care has focussed on the care of older people. Older people appear to respond positively to a range of technologies: health-care robots for health-care, chores, social activities and maintaining independence (Broadbent et al., 2012; Cavenett et al., 2018; Sharkey & Sharke, 2012); robotic animals to reverse loneliness (Banks et al., 2008; Kanamori et al., 2002); iPads and web-based applications to support psychosocial treatments (Rehm et al., 2016); online healthcare portals to support living independently at home for longer (Nikou et al., 2020); and Virtual Reality (VR) and social robots as therapy tools to improve day to day life (Cavenett et al., 2018; D'Cunha et al., 2020). Technology also helps maintain physiological health by preventing adverse events such as falls, ensuring safety around the home, and alerting the workers if something is wrong (Soro et al., 2017, p. 2). Further development of robotics and Artificial Intelligence (AI) is underway with trials in aged care settings seeking to understand older people's perception of assistive robots (Čaić et al., 2018; Khosla et al., 2012).

Research has indicated that overall, the benefits of technology outweigh the potential risks for the older person (see for example Zhang et al. (2012)). However,

several unintended consequences and ethical risks of technology adoption have been identified. Firstly, technology can contribute to over-dependence, de-skilling and disempowering of older people (Soro et al., 2017; Wilson, 2018). Video monitoring of older people raises ethical concerns about the deprivation of liberty and the need to ensure an appropriate balance between the privacy of the older person and their physical safety (Sharkey & Sharke, 2012). The increased flow of data between technologies and between organisations, and the resulting potential for privacy violations alongside diminished control held by older people over their personal information, raise new practical and ethical challenges (Soro et al., 2017; Tun et al., 2020).

Scholars have also found that when workers are replaced by technology, older people may lose the regular human contact that they previously received. For example, prior research has found the companionship afforded to older people by cleaners in their homes can often be more important than the duties performed (Sparrow & Sparrow, 2006). Recent research has also identified that some older people reject robots as a replacement for humans in terms of care and interaction (Čaić et al., 2018; Cavenett et al., 2018; Tuisku et al., 2019). In particular, older people may experience greater social isolation (Kapadia et al., 2015; Milligan et al., 2011; Poland et al., 2005; Sparrow & Sparrow, 2006), and prefer person-to-person contact (Goodwin et al., 2014; Walsh & Callan, 2011). Hence, while the replacement of physical labour by technology may improve workforce productivity, it may also reduce human connection. As a result, there have been recent calls to further understand and assess the impacts of emerging technology on social isolation and social participation (Baker et al., 2018).

A recent study by Čaić et al. (2018) illustrates how technology can have positive benefits for older people, while simultaneously producing potentially negative outcomes. It found that socially-assistive robots safeguard physical health and support social contact and psychosocial health for older people. The study also found robots led to improved service quality and productivity for organisations. However, the study warned of both value creation and value destruction resulting from the introduction of socially assistive robots in aged care. At the same time as enabling social interaction, social contact and cognitive health, there were concerns that technology could also intrude upon physical health and social contact and deactivate cognitive health (Čaić et al., 2018, p. 196).

Within the field of robot ethics, also known as roboethics, a social and ethical problem often identified with the introduction of intelligent machines includes the humanisation of the human-machine relationship (Veruggio & Abney, 2012, p. 1508). AI cannot currently emulate empathy which is required in healthcare; thus, technology will only augment, not replace, care work (Pink, 2008). However, there is an argument that the use of social robots in aged care is unethical as it is a form of deception of the older person and the relationships they form (Sparrow & Sparrow, 2006). Researchers in this area debate whether, by violating the right to psychological wellbeing, the reduction in liberty and participation in society could be considered a form of cruelty and could contravene the *Human Rights Convention (1949)* (Sharkey & Sharke, 2012). Following the exploration of robots providing care, researchers have called for further studies into the potential for technology in aged care to contribute to "dehumanisation" of relationships and the impact of reduced human touch on vulnerable groups, including older people (Wirtz et al., 2018).

A contrasting debate positions technology as a means to solve a problem, or as a means to enhance human needs. Soro et al. (2017) argue that the focus on assistive technologies is stereotyping older people as needing constant care and attention, and that effort should focus on healthy lifestyles, individual values, and older people's aspirations. This shifts the focus from ageing as a problem to solve, to one that is simply a stage of life that technology can help people enjoy. As Sparrow and Sparrow (2006) argue "Too often, in our society, older persons are considered only as problems, or as objects of study, rather than as full citizens with a valuable contribution to make to the community." (p. 156). While these studies focus primarily on the impact of technology on older people, they do illustrate the central dilemma of balancing the benefits afforded by technology against the risks to the provision of person-centred care faced by aged care providers implementing technology.

Technology and the Aged Care Work Environment

The pace of technological change provides numerous opportunities for aged care providers to consider technology to solve challenges within the sector. Technology can improve the quality of care provision by supporting workers' physical labour, such as lifting older people or moving heavy objects such as food and linen trolleys (James, 1992). Plus, it can assist with the emotional or psychological labour of aged care work by aiding communication and social interaction with older people (Rehm et al., 2016). However, the nature of care adds layers of complexity because the provision of quality care requires considerable time and expertise in getting to know the older person "as a person" (James, 1992, p. 503). Yet research into technology use in the aged care work environment is only beginning to emerge.

Across work environments more generally, technologies such as intranets, electronic communication tools, and systems to support customer, financial, human

resource and other work process management, are increasingly seen as essential for improved workforce productivity (Mohsen et al., 2019). However, studies of workers across various industry sectors show that the multitude of devices and interfaces with which a worker must interact can lead to stress in the workplace (Tarafdar et al., 2015). Studies have also raised questions as to technology leading to social and professional isolation (Taylor et al., 2017) and dehumanisation of work as methods of communication change (Barnes, 2012; Sävenstedt et al., 2006). This is an important consideration given the importance of teamwork in the provision of person-centred care delivery (Oppert et al., 2018). Yet research is still nascent in revealing how new technologies impact on workplaces and workers, and there have been repeated calls for more studies which address the emergence of the digital workplace and the impacts of technology on relationships and effective collaboration (Mohsen et al., 2019; Wang et al., 2020).

Growing levels of investment in technology are being seen across the aged care sector. This includes technology that improves rostering and fiscal management, electronic care management, and electronic medication administration (IBISWorld, 2018). Greater use of technology alongside changing models of care is being further encouraged as a way of innovating practices within the sector (Aged Care Workforce Strategy Taskforce, 2018, p. 95; Royal Commission into Aged Care Quality and Safety, 2020a, p. 34). For example, the Australian Medical Association recently released a position statement seeking innovation in the aged care sector, with an emphasis on the use of technology (Bartone, 2019). Forecasts predict the most common technologies which will affect the health care and social assistance workforce will be in the areas of process automation (code programmed to complete pre-defined, logical and rule-based processing tasks); assistive robotics (reinforcement learning and

sensors to physically interact with humans in an emotive manner); sensory perception (systems that use machine learning and sensors to detect and extract meaning from external stimuli); generative design (agents using reinforcement learning and sensors to interpret creative data and generate concepts); and mobile robotics (programmed to move between points in a controlled environment) (Priddis et al., 2020, pp. 46, 94-95).

In the aged care work environment, studies on the use of technology by aged care workers have focussed on specific technologies such as electronic health records and clinical management systems (Yu et al., 2013; Zhang et al., 2012). These systems have been found to provide substantial benefits including more efficient access to and flow of information, faster completion of required documentation, greater decision-making autonomy; more detailed information to acquire funding; and greater control over care quality and the work environment (Zhang et al., 2012). At the same time, the introduction of technology into aged care work environments has also reduced face-to-face communication and increased the risks associated with neglecting to review past clinical notes captured electronically (Yu et al., 2013).

The provision of remote care and integrated care through technology has also been studied. Provided for many years in Australia and recognised internationally as an effective way of improving workforce productivity (OECD, 2020, p. 12), trials with integrated care models between care professionals in different organisations have shown that technology can assist with communication and information flow of records. However, case studies from across seven (7) countries, including Australia, suggest that "high-touch" personalised care was preferable to "high-technology" enabled integrated aged care services for professionals (Goodwin et al., 2014). During 2020 the COVID-19 pandemic accelerated technology use within aged care with the

widespread adoption, beyond traditional applications, of videoconferencing technologies to support telehealth (Barnett et al., 2020; Fowkes et al., 2020).

The implementation of technology by aged care providers may be resisted by aged care workers. Studies of technology in aged care emphasise that, before making investment decisions, there is a need for decision-makers to understand the workplace context, the potential impact on workers, and the level of trust by workers in the technologies (Edwards & Ramirez, 2016; Erebak & Turgut, 2018). Introducing technology into the aged care workplace is a signal that can shift organisational culture and potentially influence the decisions made by workers in ways that are unintended by decision-makers (Eden & Burton-Jones, 2018; Fleming et al., 2018; Killett et al., 2014). The dynamic relationship between new technology and the humanistic nature of aged care means that culture can be created, maintained or disrupted by worker affordances of the new technology (Eden & Burton-Jones, 2018).

For example, a recent study of the introduction of electronic documentation in community care unintentionally altered existing relationships between workers, managers and older people (Wu, 2020). Brown and Korczynski (2010) also found community workers distanced themselves from the organisation when scheduling and monitoring technology was introduced because it was perceived as controlling and workers believed that those in management were minimising the delivery of meaningful care (2010, pp. 426-427). These studies reinforce the criticality of the "human element" of technology with the need for strong leadership and worker buy-in for the technology to achieve its intended outcomes (Buntin et al., 2011, p. 470). Wu (2020) echoes calls for research into how technology influences workers' feelings of task significance and meaningfulness (Wang et al., 2020, p. 715), and notes that

"greater attention should be paid to the ways new technologies are developed and designed in the context of bureaucratic demands and institutional goals" (p. 399).

The place-sensitive nature of aged care, be it residential or community, also contributes to the impacts of technology on workers (Douglas et al., 2017; Poland et al., 2005; Radford & Meissner, 2017; Shulzhenko & Holmgren, 2020). These studies demonstrate the importance before the technology is introduced, of acknowledging the place sensitive nature of care, and workers' existing knowledge of technology.

Resistance to technology has also been linked to workers' perception that technology impeded "the professional values of full attention to the patient and knowledge exchange" (Shulzhenko & Holmgren, 2020, p. 16). This resulted from frontline workers' inability to negotiate the intended effects of technological change (Shulzhenko & Holmgren, 2020). A potential disconnect between the views of management and the experience of workers was also highlighted by Cavenett et al. (2018) who identified stark differences between managers and staff following the introduction of VR. Managers assumed staff had sufficient capacity and experience of the technology, however, workers saw it as time-consuming and not something integral to their roles (2018, p. 202).

Højlund and Villadsen (2020) studied residential workers' responses to technology in daily care routines and community workers' responses to case management technology. They found that aged care workers developed specific coping strategies when engaging with technology, including striving to "embrace, resist, or modify technologies in their daily working" practices (2020, p. 191). They also called for further field studies to explore "workaround strategies" that emerge when technology is introduced into the frontline care work environment, and the need to explore managerial concerns. Dupret (2017) identified a need for further research

into how management recognises technology avoidance (2017, p. 185), suggesting that this repositioning may be easier to govern at an organisational level and may ultimately provide safer systems (Dupret, 2017). These studies highlight the importance of understanding the perspective of senior managers when exploring technology in the aged care workplace, and the extent to which workers are involved in the consultation process.

Crucial questions are being raised about the impact of technology adoption decisions by aged care provider senior managers. The shift to a market-based industry that has financial pressures and a focus on technology to improve productivity could adversely impact the humanistic provision of aged care work (Kapadia et al., 2015; Killett et al., 2014). By understanding senior manager intentions of technology use, insights into the future of caring for older people will be gained. Affordance theory, which is discussed in the following section, is an ideal lens through which to understand senior manager intentions about the adoption of technologies in aged care and how technology contributes to the goal of quality care of older people.

Summary of Technology and the Aged Care Context

With the rapid development of technology, it is important to consider the cultural and ethical issues of technology adoption in the care for older people. Research to date has focussed on technology to support older people requiring care, with calls for research into how technology can improve the physical health and decrease social isolation of older people whilst being wary of the potential "dehumanisation" of relationships linked to the use of technology. Within the work environment, the direct impacts of an increasingly digital workplace on workers and the influence of technology on the meaningfulness of their work tasks are not yet known. Instead, studies have focussed on specific technologies and ways to encourage the adoption of

technology in aged care. There are calls for further research that acknowledges worker avoidance strategies and encourages innovation, and acknowledgement of the need to understand the role of senior managers in technology adoption. This study addresses this gap by exploring what affordances senior managers have of technology adoption to care for older people.

Affordance Theory

Affordances are the qualities or properties of an object that defines its possible uses or makes clear how it can be or should be used (Merriam-Webster.com, 2020). Originally a theory applied in ecological psychology as the interaction between an actor with the environment, Affordance Theory enables the exploration of how an "actor" can achieve their "goals" through the use of an "object" (Gibson, 2014). Hutchby (2001) was the first theorist who applied affordances to technology. He claimed that the "affordances" given to technology reveals insights into the relationship between technology and humans and the "technological shaping of social action". This theoretical lens will be applied in the current study to explore the expected qualities of technology from the perspectives of senior managers in the unique context of a large, complex organisation that provides care for older people.

In the context of technology in organisations, Affordance Theory explains the relationship between an individual or a group (the actors) and the bundle of affordances given to technology (the object) to achieve their goals within an organisation. For example, workers perceiving mobile phones allowing "communication with colleagues" or electronic health records enabling the "capture of health data" to achieve the goal of caring for older people. Acknowledging the epistemological differences between information technology studies and organisational studies (Orlikowski & Barley, 2001), affordance theory yields insights

into the interaction between technology and individual actors to explain the techno-social interactions embedded within an organisational context (2001, p. 158). Figure 2.2 below depicts the theoretical framework of Affordance Theory, adapted from Gibson (2014).
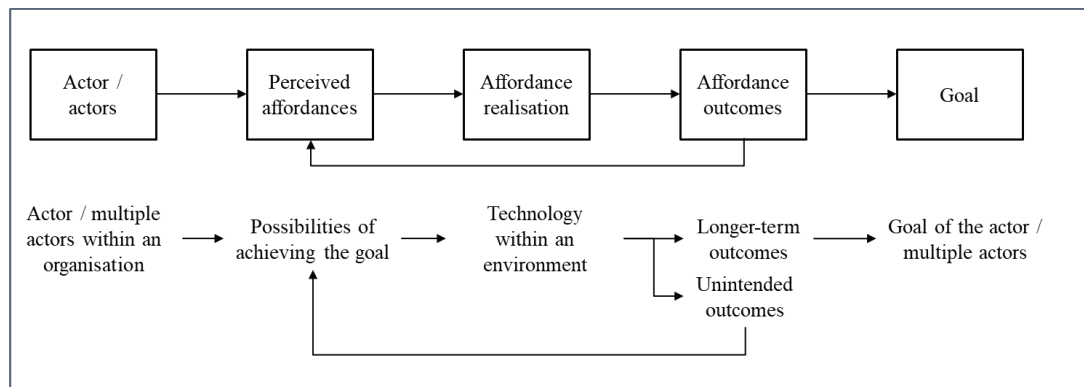
Figure 2.1. Adaptation of Gibson's Affordance Theory (2014)

Actor / Actors

Affordances are identified from the unique perspective of an actor (an individual within an organisation), or a group of actors (a collective of people with similar attributes). By way of example, a group of actors could be senior managers, supervisors, or workers in an organisation or older people who receive aged care services. When considering the affordances of a group of actors, it is important to consider them as a collective of shared affordances, rather than attributing all affordances to each member of the collective (Volkoff & Strong, 2017).

Perceived Affordances

Affordances are the possibilities for the goal-directed action, in contrast to the realisation of these actions or the outcomes of the actions (Strong et al., 2014), illustrated above in Figure 2.1. Exploring the affordances of technology before it is implemented captures a user-centred understanding of what is expected of the technology. By identifying the possibilities of technology in organisations, this theory provides an opportunity to pre-empt technology adoption issues. Exploring the

perspectives of different actors and the bundle of affordances they have of technology to achieve the goal of caring for older people before they are actualised (or realised) allows for comparison and action to be taken (Volkoff & Strong, 2017).

By exploring the possibilities, or 'perceived affordances' that an actor holds, affordance theory can enhance the understanding of the relationship between social actions and technology, and the enabling and constraining effects of technology (Hutchby, 2001). For example, research on social media affordances in the workplace by Treem and Leonardi (2013) identified four affordances to communication technology: visibility, editability, persistence, and association. Identifying these affordances provided the ability to explore how they might alter three communication processes of socialisation, information sharing, and power processes in organisations, and identify specific areas for further research to understand the relationship between technology and these processes.

Affordance Realisation

The realisation of an affordance is achieved when technology is used by the actor in their environment (Pozzi et al. (2014). Researchers argue the effort required to realise the affordance contributes to whether the affordance is realised or not (Bernhard et al., 2013). That is, if the use of technology requires a relatively low cognitive load, the affordance will be realised more easily. Focussing in on the act of realising an affordance helps researchers understand the potential barriers to actors using the technology in the future (Pozzi et al. (2014).

Affordance Outcomes

The realisation of affordances through the implementation of technology results in either immediate outcomes, or a step towards the longer-term outcomes held by actors to meet their goal (Pozzi et al., 2014; Strong et al., 2014). Applying the

Affordances Theoretical Framework adapted from Bernhard et al. (2013) and developed by Pozzi et al. (2014), these short term steps are the realisation of the perceived affordance, and the longer-term effects are the 'affordance effects' or affordance outcomes. Examining affordance outcomes helps identify interventions which are needed to get the most value out of technology investment to achieve organisational goals (Strong et al., 2014).

By assessing the effects of technology adoption against the desired affordance outcomes, actors can identify unintended outcomes (or unintended consequences) from technology within the environment and take appropriate action. Figure 2.1 above illustrates the actualisation process and the potentially iterative process of achieving affordance outcomes directed towards a goal. If an unintended outcome is achieved, and actor may re-develop their perceived affordances of technology so that the goal may be achieved.

Goal

When identifying perceived affordances, the goal to which actors are oriented towards is the goal of the organisation, not of the individual (Strong et al., 2014). In the case of technology within aged care, the organisational goal is caring for older people.

Affordance Theory Within Technology Studies

Affordance theory provides insights for technology developers into the uses of technology, or human-computer interaction, and related organisational change (Pozzi et al., 2014). For example, Zhang (2008) identified affordances to help technology designers influence technology users to achieve "high motivation affordance" so they were "attracted to the technology, really want to use it and could not live without it" (Zhang, 2008, p. 145). Such motivational affordances were subsequently taken up by numerous researchers, including Jung et al. (2010) who explored how to enhance the

human-computer interface to stimulate improved performance in group collaboration environments facilitated by technology; and Rupp et al. (2018) who explored technology acceptance of wearable fitness devices. As a contrast to encouraging technology adoption, affordance theory was used by Mannell (2019) to identify ways technology was used to stop its function of enabling communication so that users could limit their contact with friends and family.

Despite numerous technologies investigated in prior studies being found within the aged care work environment (for example, online collaboration environments, wearable fitness devices, and mobile communication mentioned above), it is important to understand the uniqueness of the aged care work environment. The humanistic nature of care work will result in different affordances of technology to other workers in more non-humanistic environments. As Bloomfield et al. (2010) highlighted with their study of technology provided to people with a disability, there is an inextricable relationship between what an object enables and the disabled person using it. Applying this concept to prior studies, the affordances identified for online collaboration technology will be unique within aged care due to the importance placed on building relationships between people communicating through the technology.

Affordance theory has, however, attracted criticism from both ontological and practical perspectives. Affordances are perceived by an individual rather than being an objective reality, so there is no "definitive list of possibilities" that can be gathered (Oliver, 2005, p. 406). Therefore, the possibilities, or affordances, that are identified for technology are sometimes viewed as speculative, rather than comprehensive and practical (Oliver, 2005, pp. 403, 409).

Affordance theory is also limited by the potential misinterpretation of information by actors when identifying their affordances (Gibson, 2015, pp. 133-134).

For example, a worker may be offered an iPad and afford it the ability to provide "access to web-based applications" to enable their care service delivery. It could be reasonable for workers to assume this given the general expectations of iPad functionality. However, if an organisation has not provided internet-enabled iPads the technology can only function as a data capture device and cannot provide the potential use anticipated by the worker. In this way, the worker has misinterpreted the affordance or possible action the iPad could enable within the work environment. This results in the identification of affordances that can never be realised which may render the practical application of affordance theory problematic.

Affordance Theory in Aged Care

Within aged care, the application of affordance theory has been limited but offers significant potential. Affordance theory was used by Fernando et al. (2016) to develop a theoretical model of digital assisted living before technologies were implemented, where they described the inter-relationships between affordances and the potential to enhance or contradict each other. The model was then used to assess whether the implementation of smart home technologies realised these affordances for older people in their homes. Affordance theory was also adopted in the development of a Residential Care Environment Assessment Tool which enabled researchers to assess the enabling/positive or negative/restrictive affordances from the perspective of older people with dementia (Topo et al., 2012, p. 123). Affordance theory, and specifically emotional affordances, was further utilised by Vallverdú and Trovato (2016) in a study of the development of AI and robotics for the care of older people. In this study, the identification of emotional affordances provided a deeper articulation of the "human architecture" of emotions to aid the more comprehensive development of "robotic emotional architecture" (Vallverdú & Trovato, 2016, p. 330).

Affordance theory, therefore, offers significant potential to understand how technology is shaping the unique work environment of aged care in Australia. As Topo et al. (2012) found, the complexity of interests in caring for older people impacted the ability to realise affordances. For example, the placement of visible hygiene products within an older person's room was more efficient for the organisation's caregiving practices but created a "clinical character" within the space for the older person (Topo et al., 2012, p. 129). In this study, the organisation became aware of the negative impacts by assessing caregiving practices against the older person's specific affordances of their unique environment.

As key decision-makers within organisations, it is important to identify and define the affordances that are given to technology by senior managers. Considering the growing external and internal pressure on senior managers to adopt technology to address the challenges of the aged care environment, affordance theory allows the removal of the influence from multiple technology developers and their perceived uses of technology, and instead, focuses purely on the technology-agnostic affordances of senior managers. Following Treem and Leonardi (2013), the study will "transcend the particularities of any technology or its features" (2013, p. 147) and focus on the affordance to be realised, thereby building the theory about the relationship between technology, workplace dynamics, and aged care challenges. The swift development of new technologies in the aged care context will see existing technology become redundant within a short time, whilst the drivers for senior manager investment in future technology will likely persist. Hence, the focus in this study on affordances will future-proof the research from changes in specific technologies and their promised solutions.

In summary, affordance theory can facilitate an examination of the possibilities of technology from the perspectives of senior managers with the goal of caring for older people. By focussing on the considerations being made by senior managers before the technology is introduced, the theory allows for analysis of whether their affordances have been realised following the introduction of technology or whether they remain unrealised. Unrealised affordances thereby identify an opportunity for future technology to be developed.

Summary of Research Gaps and Questions

Extant research highlights the increasing societal, financial, and workforce pressures on the aged care sector. For providers within the sector, this includes the increasing demand for aged care services, underlying operational challenges to meet shifting models of care, financial viability pressures and a dependency on government policy and funding, and the resultant need to build capacity and capability in the aged care workforce (Aged Care Financing Authority (ACFA), 2020; Aged Care Workforce Strategy Taskforce, 2018; Royal Commission into Aged Care Quality and Safety, 2020a). Aged care providers and government policymakers are turning to technology to address many of these challenges.

Prior research has examined the impact of technology on older people (see for example Banks et al. (2008); Broadbent et al. (2012); Cavenett et al. (2018); Kanamori et al. (2002); Nikou et al. (2020); Rehm et al. (2016); Sharkey and Sharkey (2012); Soro et al. (2017)). However, there is comparatively little research that investigates the ability for technology to address the other emerging challenges in the aged care work environment on workers. Calls have been made for further studies into the potential "dehumanisation" of relationships between workers and older people from service robots (Wirtz et al., 2018), the impact of digital workplaces on worker relationships

and effective collaboration (Mohsen et al., 2019; Wang et al., 2020), and how technology influences workers feelings of task significance and meaningfulness from work (Wang et al., 2020, p. 715). These issues are likely to be shaped by the approach to technology adoption that is taken by senior managers in aged care providers.

Comparatively little is known about the considerations, intentions and bureaucratic expectations of senior managers, as the key decision-makers of technology investment, when adopting technology (Bharadwaj et al., 2013; Eden & Burton-Jones, 2018; Fleming et al., 2018; Killett et al., 2014; Wu, 2020, p. 399), or how the dynamics of work and workplaces are shifting as a result of technology (Højlund & Villadsen, 2020; Kapadia et al., 2015; Mohsen et al., 2019). Given the humanistic nature of care, it is important to gain a deeper understanding of senior managers' affordances of technology in the unique aged care work environment (Topo et al., 2012).

This study will address this gap in knowledge and answer the research question: *From the perspective of senior managers, how is the introduction of technology into aged care shaping the work environment?* To answer the overarching question, this study will investigate:

1. *What technologies are being implemented in aged care?*

2. *How are decisions to adopt these technologies influenced by the internal and external aged care context?*

3. *What are the perceived affordances provided by technology to senior managers and have these been realised?*

Responding to calls for research into the unique position of senior managers as a "special kind of end-user" of technology (Wang et al., 2020, p. 716), this study will focus on senior managers and their affordances of technology to achieve the goal of

caring for older people. This research will also contrast to studies which are limited to a focus on the technological affordances of a functional process within an organisation, for example, Treem and Leonardi (2013)'s study of social media affordances for organisational communication processes. By exploring the affordances senior managers have of technology more generally, it is possible to understand the strategic intent of technology adoption and the ability for technology to respond to challenges in aged care whilst still achieving organisational goals. This will also provide opportunities for technology development to extend and address unmet needs across the aged care work environment. Ultimately, the affordances given to technology by senior managers will provide an insight into the relationship between technology and humans, and the "technological shaping of social action" (Hutchby, 2001).

By defining the affordances senior managers have of technology, technology developers and policymakers will be more informed when considering product or policy development into the future. Considering affordances in the design of technology and the policy landscape will improve the "useability" of technology in the future as it focusses on the interactions between users and technology by taking a user-centred approach (Gaver, 1991, p. 83). Adopting affordance theory also equips policymakers with a greater level of understanding as to how to promote policies that nudge a system of users towards a sustainable outcome, as theorised by Kaaronen (2017). With specific affordances for the aged care work environment being defined, a deeper understanding of the implications of technology within the humanistic nature of care work will be gained.

Affordance theory will also provide insight into changing work practices. As posited by Leonardi and Barley (2008), when technology enables workers to do new things, tasks and roles frequently change. For example, communication technology

enables workers to interact with colleagues in new ways and communicate with occupations with which they previously had no contact (2008, p. 165). This theoretical lens also provides an opportunity to explore the extent to which senior decision-makers in an aged care organisation take into account the impact of technology on the care worker, their relationship with the older person, their role requirements, and their skills needed for working in the new work environment. With the potential impact of technological change on the aged care work environment not yet clearly understood, this research responds to calls to investigate if the assumptions held and the decisions made by senior managers support the type of environment expected by society in the future (Fleming et al., 2018).

Chapter Summary

This literature review has outlined the structure, funding arrangements, workforce characteristics, and societal, economic and workforce challenges of the Australian aged care sector, together with the government and aged care provider responses to these challenges. With the relatively high importance placed on technology to address challenges within the sector, the review provided an insight into research on the use of technology within aged care. The scarcity of research was highlighted into how technology is shaping the aged care work environment in relation to support for the humanistic nature of care work. It also highlighted the lack of understanding in how senior managers, as the key decision-makers of technology investment, view technology as a way of meeting the goal of caring for older people.

This study will address these under-examined areas of research to inform policy development and organisational strategies for technology and aged care providers and government alike. It will do this by investigating the realisation of senior manager affordances of technology in aged care. The study will answer three (3) research

questions that focus on the current technology adopted in a large aged care provider, the internal and external context for senior manager decisions relating to technology, and the affordances of technology from the perspective of senior managers. Collectively these insights will explain how technology is reshaping the aged care work environment. The following chapter outlines the methodology and approach to this study.

Chapter 3: Research Design

This chapter describes the design adopted to achieve the research aims and objectives stated in Chapter 1. The first section of this chapter discusses the critical realist paradigm adopted for this study and the qualitative methodology used. The second section details the research design, including a description of the aged care provider studied in this research, participants interviewed, instruments administered, and the procedures followed for the study. This is followed by a detailed description of the approach taken to analyse findings. Finally, the ethical approval received, and transferability of findings are described. The chapter is designed to provide sufficient detail to support the dependability and confirmability of this study (Shenton, 2004).

Methodology

Research Paradigm

Underpinning this research is the critical realist ontological paradigm (Bhaskar, 2008), which is defined as "the way reality is experienced and interpreted is shaped by culture, language and political interests" (Braun & Clarke, 2013, p. 328). Knowledge of what and why things happen (that is, reality) is gained from uncovering knowledge of what actually happens (that is, the generative mechanisms to create the reality) and what is perceived to be happening (that is, the observations of reality from an empirical domain) (Bhaskar, 2008). Through this paradigm, the reality of how technology is shaping the aged care work environment will be understood by uncovering senior manager affordances of technology, and the social context and structure that surround their decision making.

Epistemologically, this research takes the position that legitimate knowledge is contextual (Tebes, 2005). Senior Manager perspectives are critical to understanding

the context within which technology is being implemented and how it is shaping the work environment (Ackroyd & Fleetwood, 2000). Qualitative methods allow for an empirical understanding of how senior managers interpret the actual and perceived social realities within their organisation (Smith & Elger, 2014). Given the complexity of aged care work, which requires a depth of human understanding and touch to be successful, it is important to gather data that provides a deep understanding of the contextual nuances of aged care work. Qualitative methods are therefore the most appropriate and valid way to gather data on the perspectives of senior managers and add to the validity of the research in aged care (Healy & Perry, 2000).

Methodology

With little research into the way technology affects the humanistic nature of aged care (described in Chapter 2), and the strong influence senior managers have over technology investment decisions, this study explored the research question: *From the perspective of senior managers, how is the introduction of technology into aged care shaping the work environment?* To answer the overarching question, the study investigated questions that were designed to uncover concepts and inter-relationships, thereby providing greater rigour to the study (Gioia et al., 2013). These research questions were:

1. *What technologies are being implemented in aged care?*
2. *How are decisions to adopt these technologies influenced by the internal and external aged care context?*
3. *What are the perceived affordances provided by technology to senior managers and have these been realised?*

Research Design

This study employed qualitative research design methods, with semi-structured interviews conducted in the aged care sector. Using interviews allowed for a deeper understanding of the social dynamics and complexities surrounding technology in a work environment (Creswell et al., 2007; Yin, 2018). Interviews also aligned with the critical realist perspective of this study to understand the reality from the social structures that surround senior manager decision making (Ackroyd & Fleetwood, 2000; Bhaskar & Hartwig, 2016). To explore the work environment in depth, most participants were drawn from one aged care provider to allow for a richer investigation of common experiences of technology in that work environment (Yin, 2018). These perspectives were then supplemented with additional interviews with senior managers from an aged care industry body and an aged care technology developer to provide an understanding of the broader aged care context. This enabled the triangulation of data to draw out and test emerging findings about the social context of technology in aged care. This comparison provided further credibility of key themes being experienced in the broader industry and improved the methodological trustworthiness of findings (Healy & Perry, 2000; Miles et al., 2014; Shenton, 2004; Van Maanen, 1979).

Using qualitative methods was also consistent with the theoretical lens of this study. Affordance theory (Gibson, 2014) captures the intentions behind investment in technology which requires deeper examination and description that cannot be gained from alternative methods such as surveys (Bernhard et al., 2013, p. 4; Pozzi et al., 2014, p. 10). Given the compatibility of methods to this theory, the credibility of this study is further strengthened (Shenton, 2004).

Large Australian Aged Care Provider

One large Australian aged care provider (the provider) was selected for this study. This not-for-profit (NFP) provider operated across two Australian states, employing nearly 9,000 staff within their residential and community care service areas. In the calendar year 2019, the provider held over 3,000 residential beds within over 50 residential facilities and provided over 3 million community care visits to over 60,000 older people. The organisation's goals for aged care included delivering high-quality, human-centered care and being innovative.

Publicly available information indicated that the provider was investing in technology to support new practices in the workplace. Their recent investment in workforce-enabling systems was also known to the researcher through her prior professional experience. This technology profile was considered similar to data which baselined technology sophistication in residential aged care organisations (Alexander et al., 2019). Contextually, the provider was typical of large providers operating in the sector; it was a NFP and was experiencing financial pressures (Aged Care Financing Authority (ACFA), 2020; StewartBrown, 2020).

Selecting a large organisation allowed for several nuances to be explored. Being a large business delivering multiple aged care services allowed for both the residential and community care contexts to be studied within the one organisation. Deeper exploration of the unique affordances identified by different organisational actors was permitted by having multiple organisational layers and senior managers with more distinct areas of responsibility. These unique perspectives then allowed the complex systems surrounding technology in aged care to be explored (Poland et al., 2005; Yin, 2018).

Participants

A purposeful sampling strategy identified participants for the study (Creswell et al., 2007). This ensured individuals were selected based on the nature of the research problem and would provide the most information-rich data for the research question (Cassell, 2009; Patton, 1990; Yin, 2018). As the focus of this research was on senior manager affordances, participants were deliberately selected at the Executive and Director level. Actors in this organisational layer are the key decision-makers in technology implementations. They are also viewed by workers as important mediators of external pressures to their role including the impacts of technology and how it shapes the workplace (Killett et al., 2014; Myers & Newman, 2007; Smith & Elger, 2014).

Participants were selected from within the provider, and from the aged care industry more broadly. Within the provider, twenty-one (21) participants, out of a total pool of fifty (50) senior managers, were identified based on the role they held. This was done in consultation with a Director from the provider who described each participant's role. Participants were selected from several business units: Information Technology (IT); Aged Care operational roles; and, Human Resources (HR). For those in IT and HR units, participants were selected based on how their role supported aged care service delivery. An introductory email to each member of the invitee pool was sent by the provider's Executive, stating clearly that participation in the study was voluntary to ensure genuine participation and credible data was collected (Shenton, 2004). The researcher then contacted each invitee with a pre-approved email, interview information sheet, and interview consent form, stating again that the participation in this research was voluntary.

During February and March 2020, when the interviews were being conducted, the 2020 COVID-19 pandemic began to impact on the aged care sector. Consequently, only fifteen (15) invitees agreed to participate, and three invitees subsequently cancelled their interviews. The final sample size from within the aged care provider was twelve (12). Interviews were conducted in locations identified by participants, all of which were in private areas, except for one interview which was held via video-conference technology due to physical distancing rules which came into force.

To expand the data set, several industry professionals were identified by the researcher during attendance at the Information Technology in Aged Care (ITAC) 2019 conference. These individuals were invited to participate due to their seniority within their organisation and the length of experience working in the sector. Two Executives from two different technology developers that have technology products used in aged care were invited with one agreeing to participate. In addition, two aged care industry-body professionals were invited, with both agreeing to participate. The researcher emailed each person with an interview information sheet and interview consent form. All interviews were held via video-conference technology, as this was preferred by the participants.

In total, sixteen (16) interviews were completed with fifteen (15) participants. This sample size aligns with recommendations for studies of this order (Marshall et al., 2013). One participant was interviewed twice because of their depth of knowledge about the topic, and to test the themes emerging from other interviews. This member-checking approach contributed to the credibility of the findings and the rigour of this study (Lincoln & Guba, 1986). Interviews ranged from forty-one (41) minutes through to two hours and twenty (20) minutes. A total of nineteen (19) hours and sixteen (16) minutes was recorded. Most interviews extended beyond one hour despite the seniority

of the participant pool and the initial time constraints placed on the interview length. This demonstrated the willingness of participants to engage in the research topic. Characteristics of participants are presented in Table 3.1 below.

Table 3.1

Participant characteristics, ordered by business area

Participant pseudonym	Business Unit	Age Range	Gender	Years in Aged Care	Time in Current Role
AC Leader1	Aged care services	55-60	Female	19	8 years
AC Leader2	Aged care services	55-60	Female	30	1 year
AC Leader3	Aged care services	50-54	Female	20	6 months
AC Leader4	Aged care services	65-70	Female	7	7 months
AC Leader5	Aged care services	55-60	Female	28	6 months
AC Leader6	Aged care services	45-50	Male	3	1 year
AC Leader7	Aged care services	45-50	Male	3.5	3.5 years
HR Leader1	Human Resources	55-60	Male	3	2 years
HR Leader2	Human Resources	50-54	Female	10	1.5 years
HR Leader3	Human Resources	45-50	Female	2	1 year
Technology Leader1	Technology	40-45	Male	0	7 months
Technology Leader2	Technology	60-64	Male	0	6 months
External Industry Leader1	Industry professional	45-50	Male	14	5 years
External Industry Leader2	Industry professional	55-60	Female	38	8 years
External Technology Provider	Industry professional	55-60	Female	32	23 years

Of the fifteen (15) participants, nine (or 60%) were female. The average age range was 50-54 years old, mirroring the average age of the aged care workforce. The years of work experience in aged care varied significantly from two participants being new to the industry, through to a participant working in the industry for 38 years. However, the average years worked in aged care was 14 years, indicating participants had a deep working knowledge of the sector. The time worked in their current role also varied significantly with seven participants, or just under half, working in their role for one year or less.

Instrument

Interviews were conducted using semi-structured interview guides developed from the literature which were reviewed by the researcher's supervisory team. This approach strengthened the dependability (or reliability) of the instrument (Creswell & Creswell, 2017; Lincoln & Guba, 1986). Separate semi-structured interview guides were developed for participants within the provider, within the industry, and within the technology developer and are included in Appendices A, B and C. Interviews had four main parts: demographic information; questions relating to technology already implemented in the aged care workplace; questions relating to plans to implement technology in the workplace; and, questions that were specific to the participant's role. The researcher adapted interview questions for participants depending on their level of experience in the organisation, their business unit, their preference to discuss certain topics, and the time limitations placed on some interviews.

Identifying affordances that have already been realised can sometimes be difficult for participants to articulate. Identification requires a person to reflect on the workplace before the technology in question was introduced and to recall the possibilities that were being explored. Therefore, participants were asked two types of questions, one reflective on the past, and one with a focus on the future: "Prior to the implementation of this technology, what did you hope it would achieve?"; and, "What are your main drivers for adopting technology in the workplace?". Depending on time constraints, variants of the latter question were posed from different actor perspectives (supervisor, frontline care worker and older person). The semi-structured approach allowed for a more free-flowing conversation to explore nuances of technology adoption that would otherwise have been missed with a structured interview or survey (Bryman, 2003). This approach allowed the researcher to gather information-rich data

and probe deeper into certain topics to allow the causal impacts, which are contingent on the context of the aged care provider, to be explored in more detail (Healy & Perry, 2000; Yin, 2018).

Procedure

Following ethical approval (refer Ethics below) the data collection phase was conducted from February to March 2020. Interviews were initially held face-to-face until social isolation measures due to the COVID-19 pandemic required interviews to be conducted via video-conference technology (in this case, Zoom). A reflection on the impact of COVID-19 on interviews is included in Appendix D. Participant consent to conduct the interview was received before the interview commenced, with participants either signing hard copy consent forms, or printing out, signing, scanning, and emailing forms to the researcher.

At the commencement of interviews the researcher took time to build rapport with each participant to facilitate the collection of honest and credible data (Shenton, 2004). Member checking was conducted during interviews by summarising the researcher's understanding of information being shared and testing concepts with participants. This ensured robust and comprehensive data was collected and confirms the credibility (or internal validity) of the findings (Lincoln & Guba, 1986).

Interviews were recorded, transcribed, and deidentified with pseudonyms replacing names and any other identifiers. They were then uploaded into NVivo 12 software in preparation for analysis. Transcriptions were double-checked for accuracy by the researcher, with updates made directly to the original transcription file (Silverman, 2017). Transcriptions did not include references to non-verbal behaviour, except for punctuation that made the text more readable. One interview was of poor audio quality, and so was transcribed manually by the researcher. A copy of all

electronic files was stored in a secure mass storage service administered by the Queensland University of Technology (QUT).

During the data coding stage, it was decided by the researcher, in consultation with their supervisory team, to exclude care technologies from being a central focus of analysis and research findings. Care technologies were described as technologies utilised by older people to improve their health and wellbeing outcomes, and by workers to support the direct delivery of care to an older person. Although interesting, the focus of this study is on workers in their work environment, not the older person who uses care technologies. As a result, analysis focussed on workforce-enabling technologies (described Chapter 4) which were used by all workers across all sites. Participant references to care technologies continued to be coded, however, to ensure current and future care technology used in the work environment was captured.

Analysis

Following Braun and Clarke (2013), data analysis followed an iterative approach to inductively derive insights from the interview data. This involved the researcher familiarising themselves with the data set, generating codes, constructing themes, revising and defining themes, and writing up the research findings (Braun et al., 2019). These steps are described in detail below.

Firstly, the researcher **familiarised themselves with the data set**. This involved re-listening to each interview, noting topics raised by participants (Braun et al., 2019, p. 857). For example, many participants referred to differences in generational expectations of technology in the aged care work environment. This seemed to be an important consideration for many participants even without direct questioning. Other more specific topics also emerged, such as the reliance or over-reliance on funding mechanisms to direct investment towards technology in the workplace. The researcher

noted these topics in a Word document, including insightful quotes and identifying links to previous literature as part of their post-transcript review (Shenton, 2004).

Secondly, the researcher **developed codes** to allow data to be broken down, compared and categorised (Strauss & Corbin, 1990). The researcher used computer-assisted qualitative data analysis software (NVivo12) to open code "anything and everything of interest" emerging from the entire data set (Braun & Clarke, 2013, pp. 206-207). To help organise and group codes together the 'node' functionality in NVivo12 software was used. A separate node was created for each interview question in advance of coding commencing. However, the researcher found several additional topics were important for participants which required new nodes to be created. These topics included the generational differences ('Generations') and reliance on funding ('Funding model') mentioned above. Observations of the aged care industry more broadly ('Aged Care Industry') and comments about the importance of the human element in care ('Humanisation') were also outside the initial set of interview questions but emerged as important issues for participants. In each case, a node was created in NVivo12 and the participant's responses were coded into them accordingly.

During the process of **generating codes**, code labels were developed based on the essence of what the participant was saying in the interview excerpt. These codes could be described as researcher-derived codes as they used the researcher's knowledge of the literature and experience in workforce strategy and aged care to identify the implicit meanings (Braun & Clarke, 2013, p. 207). This meant that in most cases the code label altered from the explicit phrase, but the latent meaning was still evident. An example of generating codes is provided in Table 3.2 overleaf.

Table 3.2

Coding affordances example

Participant phrase (data)	Code	Affordance NVivo12 Node
"document that straight into the system" (AC Leader5).	'access to forms to complete'	'captures information'

A process of coding and recoding (Krefting, 1991) was used to generate senior manager affordance codes. After all interviewers had been coded, the researcher focussed on re-reading all interviews and identifying excerpts that identified a specific behaviour or activity that technology was supporting. Senior manager responses to questions regarding the key drivers and impacts of technology adoption proved the most productive in terms of identifying affordance codes.

The researcher then proceeded to **construct themes and sub-themes** within the data to answer the research questions of the study. To identify senior manager affordances of technology in aged care, the researcher used critical synthesis and interpretation of the data to identify 'Quality of Care', 'Efficiency of Care' and 'Operational Efficiency' as the three major affordance themes, with several more detailed affordances sub-themes emerging (Braun & Clarke, 2013, p. 223). This process involved axial coding to make connections between codes and allocate them into themes and sub-themes (Strauss & Corbin, 1990). In a process of peer review and inter-rater reliability, themes and sub-themes were then tested with the research supervisory team during regular fortnightly meetings. This provided further credibility (or internal validity) and confirmability of the findings (Healy & Perry, 2000; Miles et al., 2014; Shenton, 2004; Yin, 2018). However, when searching for patterns and collapsing sub-themes into the initial three affordance themes, the researcher identified

several sub-themes that seemed to stand out as richer and more complex than others. These sub-themes were 'Communication', 'Empowered worker' and 'Compliance'. The researcher reflected on the common mistake of relying on the number of codes within a theme to infer its meaningfulness (Braun & Clarke, 2013, p. 219). This resulted in the elevation of these new themes to the original three themes identified during axial coding.

To **revise and define themes** for senior manager affordances, the researcher handwrote each sub-theme onto a separate piece of coloured card and summarised participant references into dot points on the card. Each card was then manually grouped into a theme. This process resulted in some sub-themes being relabelled. Code labels were also refined to make sure they accurately reflected interview excerpts.

Finally, the researcher **wrote up the research findings** and reflected on the groups of themes and sub-themes to make sure they told a coherent story of senior manager affordances of technology in aged care (Braun & Clarke, 2013, p. 236). An early draft of the Findings chapter was shared with the researcher's supervisory team who questioned the nuances between the affordances and assessed them as reasonable.

Following this exercise, the researcher returned to the literature to confirm the affordance themes that were identified. This demonstrates the iterative nature of this research which brings a higher standard of reliability to this research ("Encyclopedia of Case Study Research," 2010, pp. 504-505). Reflecting on affordance theory, it became evident that what were initially identified as affordances were, in fact, examples of 'affordance outcomes' (Strong et al., 2014). This was a common mistake identified within prior affordance research (Pozzi et al., 2014), and was addressed here through a deliberate process of iterative reflection on theory. Having correctly identified themes as affordance outcomes, the researcher then re-analysed data

included in the draft Findings chapter to identify 'perceived affordances' (Braun & Clarke, 2013, p. 234). These new 'perceived affordances' were assessed against the threshold criteria for substantiating affordances proposed by Evans et al. (2016, pp. 39-41), and compared with prior research into technology affordances to confirm their credibility (or validity) (Pozzi et al., 2014; Shenton, 2004; Strong et al., 2014).

The findings from this study were tested by the researcher during a presentation delivered at the 2020 Australian Association of Gerontology conference. Questions and feedback from conference delegates stimulated further reflection on the findings of this study and the implications on government policymakers. This provided further credibility and qualitative rigour to this study (Shenton, 2004).

Ethics

Initial contact was made with two Executives within the provider to discuss the scope of the research and to request access to participants within the organisation. Both Executives offered their support and nominated a Director within the organisation as the most suitable contact with whom to liaise during the research. A series of meetings and electronic mail communication then followed between the Director and the researcher, which established a relationship of trust (Lincoln & Guba, 1986). Following written approval from the Director, ethical approval was gained from the provider's Research Approval Group (RAG) and Human Research Ethics Committee. This process involved the provider's RAG, of organisational managers and an academic from a reputable University conducting an independent review of the research methodology and design. Both the Director and the RAG's review of the research provided an opportunity to receive scrutiny on the research design, which further strengthened the credibility of this study (Shenton, 2004). During this process it was agreed that identification of the organisation would remain confidential by being

referred to as a 'large Australian aged care provider', and individuals would be deidentified by using pseudonyms.

Ethical approval for this low-risk research was also secured from the QUT University Human Research Ethics Committee (UHREC) (QUT Ethics approval number: 1900000822). Following interest from senior leaders within the aged care technology industry, an ethics variation was approved by the QUT UHREC to include industry professionals (QUT Ethics approval number: 1900000822).

Transferability of Findings

The following chapter (Chapter 4) includes details of the social context of the study, which can help to assess the transferability of the findings (Shenton, 2004). For example, findings may be extrapolated to disability care organisations facing similar financial and workforce challenges. The disability work environment is similar to aged care due to the humanistic nature of care services required when caring for a person with a disability. The findings may also have some applicability to other industries, such as early childhood education and care, where workers are required to build strong relationships with those requiring care.

Chapter Summary

This chapter described the critical realist ontological paradigm, and contextual epistemological position of this research. The qualitative method of conducting semi-structured interviews was explained. The large Australian aged care provider was then described as the main organisation studied, as well as the purposive sampling approach, interview instrument and procedures followed. The research analysis process was described, including the thorough approach taken to identifying senior

manager affordances. Finally, an assessment of the transferability of findings and ethical approval were outlined.

The following chapter presents illustrative quotes from participants and summary tables of perceived affordances and affordance outcomes to provide a "thick" description of the phenomenon under scrutiny (Shenton, 2004, p. 69). Chapter 4 also includes details of the social context of the study which can help to assess the transferability of the findings (Shenton, 2004).

Chapter 4: Findings

There is currently little empirical research that has identified the considerations and expectations of senior managers when adopting technology or which examines how the dynamics of the aged care work environment is shifting as a result. This chapter reports the findings from fifteen (15) semi-structured interviews with senior managers from a large, aged care provider (the provider) and the aged care technology industry (the industry).

The chapter begins by describing the current technology used by aged care providers to answer research question one *What technologies are being implemented in aged care?'*. For ease of reference, these technologies are classified into hardware and infrastructure technologies, and workforce-enabling technologies.

Research question two asked *'How are decisions to adopt technologies influenced by the internal and external aged care context?'*. A description of the key contextual drivers of technology adoption is followed by a summary of future technology being considered by senior managers. This includes the noteworthy finding that despite the key drivers and perceived affordances identified by senior managers, very little investment in new technology is planned for the near future.

Finally, the chapter addresses research question three *'What are the perceived affordances provided by technology to senior managers and have these been realised?'*. The perceived affordances are described including those realised through current technology as well as considerations by senior managers as to affordances of future technologies. Within each perceived affordance, reference is made to the affordance outcomes expected by senior managers from investing in technology. This

section concludes with the identification, from the senior managers' perspective, of unintended consequences from the realisation of perceived affordances.

Throughout this chapter, the term 'older person' is used to identify the person who is receiving aged care services. Other descriptors used by participants included 'client', 'customer', and 'patient'. The terms are presented verbatim within illustrative quotes. Similarly, the term 'worker' is used as a generic identifier meaning a person working in an aged care environment. The term is intended to incorporate all care roles from senior managers through to personal carers, team leaders, social care workers, Registered Nurses (RNs), Occupational Therapists (OTs), Dieticians, Speech Pathologists, General Practitioners (GPs), as well as those in non-care roles. Specific non-care roles include back-office workers in food services, facilities and maintenance, and administrative workers. The term 'allied health professional' is also referred to by participants and includes all health professionals who provide services to enhance or maintain the quality of life for older people. These include Exercise Physiologists, Physiotherapists, Podiatrists, Social Care workers, RNs, OTs, Dieticians, Speech Pathologists and GPs.

Current Technology Used Within Aged Care

The following section describes the current technology being used within the provider to answer the research question *'What technologies are being implemented in aged care?'*. Firstly, hardware and infrastructure technologies are described to demonstrate the technology environment supported by the provider to store, transmit, and receive information digitally. This is followed by a description of the current workforce-enabling software technologies that are used by most aged care workers in their roles to retrieve and manipulate information digitally.

Although not within the scope of this study, it is relevant to note some of the additional care software technologies referred to by participants. These included technologies utilised by older people to improve their health and wellbeing outcomes, and by workers to support the direct delivery of care to an older person. This division of care technologies from workforce-enabling technologies was identified by AC Leader1 as the common approach used within the organisation. For instance, technologies used by specialist workers included speech therapy applications on devices such as tablets, and dementia programs on larger touch screen devices. Participants also provided examples of specific care technologies such as the wearing of devices to capture health data, and assistive smart technology devices around the home to control the environment. The advantages of robotic toys and air hoists were highlighted, although these technologies were not widely used and were mainly described as being on trial only and too expensive for use across the organisation.

Technology Hardware and Infrastructure

Technology hardware and infrastructure underpins the delivery of enterprise applications or software used by workers. As these essentials provide the foundations of technology being used within the work environment, it is important that they support the different technologies required by workers. Within the study, the infrastructure that supports the systems used by workers was described briefly as a Citrix platform with a Windows operating system. The age, speed and reliability of the infrastructure prompted frustration by users who indicated that the choice of Windows limited the technology that could be used, "it's built on that Citrix platform, so it's really slow" (AC Leader4), and "we've had periods with quite high risk really around people being challenged with access because of [an] ageing platform" (AC Leader1).

Residential workers accessed systems via desktops that were placed at the nurses' station away from residents. This was a necessity because the age and design of many residential buildings inhibited Wi-Fi and access to the internet. Computers on wheels (known as COWS, a computer placed on a moveable trolley) had been trialled but with limited success due to the lack of Wi-Fi access.

Depending on their role, community workers accessed systems via mobile devices. Personal carers were provided with a mobile phone, and team leaders, registered nurses and allied health professionals were provided with both a mobile phone and a tablet or laptop. Mobile phones provided access to a worker's roster and their scheduled visits for the day and allowed them to capture basic notes about the visit, make phone calls, receive text messages, and gain access to a network connection (hotspot). Tablets or laptops provided workers with access to information about the older person, the ability to review and perform assessments of older people and capture case notes, including text, photos and videos of the older person. Tablets or laptops were also sometimes used by workers to show an older person their care notes, health information or home care package services and budgets.

Community workers were provided with vehicles for transport to the older person's place of residence. Vehicles were described by some workers as a "mobile office" (AC Leader4) where workers entered data into their tablets. Initially, some workers sustained injuries "because of necks being tight and being in an unnatural position to be working with a tablet for hours of the day, rather than going back to the workplace and using a desktop computer" (HR Leader2). As a result, a piece of equipment that holds the tablet and attaches to the steering wheel was made available to workers to limit workplace injuries.

In summary, the foundational layer of technology infrastructure was identified by most participants as a challenge. Even though the hardware being used was considered quite modern, the infrastructure underpinning it was "where we've got to get a load of stuff fixed if we're really going to get the full benefit of [technology]" (HR Leader1). This sentiment carried through into the conversation about future technology being considered, presented in the Drivers of Technology section below.

Workforce-Enabling Technologies

'Workforce-enabling technologies', described by AC Leader1 as the commonly used term within the industry, are those information and communication technology systems that support the worker to perform organisational tasks associated with their role. Senior managers identified workforce-enabling technologies used by aged care workers but spoke of the limited technology for themselves in their roles. As one participant noted:

> There's still quite a lot of paper-based work and processes and so on to what I'm accustomed to. I'm accustomed to working with Self Service, HR interface. A lot more slick in terms of accessing learning resources and that sort of thing. (HR Leader1)

Responses from participants focussed mainly on the technology being used by frontline workers in both residential and community work environments. Table 4.1 provides a list of the workforce-enabling systems used by workers that were most often referred to by senior managers. A brief description of the system has been summarised based on information provided in interviews, as well as an indication of the main users of the system.

Table 4.1

Aged care workforce-enabling technologies

Workforce-enabling technologies	Brief description provided by participants	Users
Business intelligence	A data warehouse that extracts data from the client management system and presents dashboards and reports for workers.	Senior managers
Care planning system	Used by case workers to capture home care package services and prepare a budget for an older person.	Community care workers
Camera	Housed in the community worker's tablet, the camera captures audio visual information about an older person and their environment for use in care planning and service provision.	Community care workers
Community management system*	Captures clinical information and notes, and supports reviews and assessments performed by workers. Generates reports on services provided to an older person.	Community care workers
Financial management system	Performs several finance tasks, including the service details and timing information about worker visits to an older person for the purposes of preparing billing information. A worker can "tap on, tap off when they come to someone's place" (AC Leader4). This provides information for the older person's invoice for services performed.	Community care workers, Finance team workers
Geo-tracking system	Identifies the geographical location of mobile devices. Also used by schedulers to measure the distances and travel time between the residences of older people to optimise travel time during a community worker's shift.	Community care workers
Maintenance system	A centralised phone number which captures all maintenance requests across the provider. The centralised team then manages the deployment of maintenance services to sites.	All workers

Workforce-enabling technologies	Brief description provided by participants	Users
My Aged Care portal	A portal provided by the Australian Government to help older people learn about aged care services, get assessed, find a provider, and manage the services they receive. Providers access this portal for information about an older person when they have been selected as their service provider. The provider also updates reporting and billing data into this portal to feed through to the government systems.	Older people and their families Community care workers
Online training modules	Provides on-demand access to the online component of mandatory training for workers.	Community care workers
Residential management system*	Captures information about an older person within the residential care facility, from clinical data through to resident preferences. Reports can be generated on a resident's care and their trajectory of care. Workers access 'workbooks' that provide information on residents and their care needs for the 24-hour period. This also serves as a 'handover report' for workers during their shift to identify any care needs yet to be completed for residents.	Residential care workers – personal carers through to registered nurses.
Risk management system	Captures incident information, complaints, and quality compliance data.	Community and Residential care workers
Video conferencing system	Transmits live voice and video data between two or more participants at different sites through computers and networks.	Not widely used
Workforce-management system	Supports workforce scheduling, rostering, timekeeping, and payroll. Scheduling functionality is used by a resource management team to schedule visits for community workers to older people's residences. Worker location and safety is monitored, as well as productivity that is analysed by the team leader, resource management and senior managers. Residential workers use a fingerprint scanner to sign on and sign off for their shift. Community workers communicate with a timekeeper administrator who entered the worker's start and end times in the workforce-management system and the community management system. Payroll is used for all workers across the whole organisation.	Community and Residential care workers

Workforce-enabling technologies	Brief description provided by participants	Users
Workplace chat	Captures and sends photos and text between individuals and between individuals and groups to communicate in the workplace. Chat groups can be created with specific members.	Community and Residential care workers

* Community and Residential management systems utilise the same technology solution, known as a client management system.

In summary, the current technologies used in aged care can be classified as care technologies or workforce-enabling technologies. Although both are supported by hardware and infrastructure, due to the cost outweighing the perceived benefits of care technologies, the main technologies used in aged care are workforce-enabling technologies. Of these, most discussion focussed on the clinical management system (known as either the Community Management System or the Residential Management System, depending on the workplace) and the workforce-management system. The clinical management system enabled workers to capture notes and access information about an older person, while the workforce-management system automated the scheduling function and provided information about worker rosters. The foundational infrastructure layer of technology was identified as a challenge in providing more advanced technology for workers, with the biggest innovation in recent years being the introduction of tablets and mobile devices to support community workers out on the road.

Drivers of Technology

This section describes drivers of technology adoption to address the research question *'How are decisions to adopt technologies influenced by the internal and external aged care context?'*. The discussion below draws out the contextual drivers

for senior manager decisions to invest in technology. It then summarises the planned investment in technology to realise the affordance outcomes attributed to technology within aged care.

Context of Technology Adoption

Several contextual issues within the industry influenced senior manager investment in technology into the future, including the shift towards community care provision, financial pressures, workforce shortages, and inter-generational differences in older people and workers.

Community Care Provision as a Driver of Technology Adoption

The shift away from residential care to focus on providing community aged care services, to be "a world-leading provider of community care" (AC Leader7) was a key driver in the adoption of technology. Residential care was "still an important component, but it's not on a growth trajectory whereas community is" (AC Leader7). This shift was prompted by "competition from so many people outside of the aged care industry" (HR Leader2) to provide residential aged care services, as well as the shift in age profile within Australia, and older people's preference to be cared for in their own home. As one participant stated:

> If you look at the stats around residential aged care versus community care, only about 14% of the Australian population in the 'aged' age bracket will end up in residential aged care. And I'm fairly certain almost 100% of those people don't want to be there. (AC Leader7)

To support this shift towards community aged care, technology was referred to as improving the efficiency and safety of the "remote workforce" (HR Leader1) and improving sustainability of the organisation "because otherwise you are simply throwing more and more resources and people at a broader population" (AC Leader7).

Workforce productivity of delivering services was a key concern discovered through analysing services performed:

> And what they identified was, I think it was in the nursing group, there was only 50% productivity. Initially, I think it was even lower than that. And so, for every eight hours that a nurse was out there on the road, there was only four hours or less that were actually being paid for. And so, obviously, that sent off quite a few alarm bells. (HR Leader2)

As a result, consideration was being given to "technology-led either efficiency or process optimisation" (AC Leader1) and a way of decreasing "our administrative burden" (AC Leader2).

The impact on the provider's brand when focussing on removing inefficiencies and cost reduction through technology was noted, with senior managers being "very careful that we don't erode the value of that whilst we work through this broader play" (AC Leader6). However, as one senior manager described:

> I think residential and community look quite different. For us as an organisation and where we sit currently, technology will enhance community services even more than our ability to deliver those services. (AC Leader4)

Financial Sustainability as a Driver of Technology Adoption

Financial sustainability was viewed as a driver of technology adoption, given financial viability pressures and the maturing consumer-driven market. Financially, providers were perceived as under threat, with a view that they operated "on the smell of an oily rag if you look at the costs that we have to do the work" (HR Leader1) and that the growth in the population to be serviced was "not sustainable" (AC Leader7). When reflecting on future investment, one senior manager indicated "so in the funding

sense, we struggle to provide care, let alone do any innovations or significant transformational work" (AC Leader1).

The shift to a "person-centred care or consumer-driven type of environment, where the package changed to the consumer" prompted the need for a "really clear understanding of the cost of delivering that service" (HR Leader2) which had not been held previously. It also appeared to create financial strain within residential care settings:

> The new quality standards are all about what the resident wants, the resident will get, which is fine, but they don't resource us to be able to do that. They want an activity program seven days a week. Well, if I provide that, I have to take something else away because I've only got this amount. (AC Leader4)

When considering technology investment in the context of financial sustainability and innovation, competitors from both the not-for-profit and for-profit sectors were mentioned. However, they were not described as a threat. It was acknowledged that "they're embracing [technology] for their workforce which creates a significant advantage that we're not matching at the moment" (AC Leader7). However, in terms of this stimulating competition and improvements to financial sustainability, providers were described as having "evolved into organisations that just feed at the government trough" (AC Leader7). A senior manager reiterated this with the view that government funding was stifling investment in technology: "since our bread and butter is coming from these funding silos there hasn't been seen a need to innovate." (External Industry Leader1).

Despite this, it was acknowledged that older people's expectations varied and that the organisation needed to be prepared "to have any of the systems that can support people as to how they want care in the future" (AC Leader2). This required technology

to transform service models "to be more contemporary" (AC Leader1). A process of "human-centred design" to identify "customer touchpoints" was described "to ensure that the technology doesn't drive the process, the technology is an enabler of the process" (AC Leader3).

Workforce Shortages as a Driver of Technology Adoption

Workforce shortages were viewed as a driver of technology adoption, given "we know that the demand for aged care is going to be massive over the next 20 to 30 years [for] support and carers" (HR Leader1). These shortages arose from several workforce challenges including a poor workforce image, casualisation of the workforce, and planned structural changes.

The poor perception of work in the industry was reflected in responses such as "not only a dirty job, but [also] doesn't pay well" (AC Leader3). Government intervention was being relied on to shift perceptions of aged care with the expectation that "our society will push our jobs to actually change, to be more respectful" (HR Leader2). Recruitment strategies were also being trialled and were "focusing very, very much on the Aboriginal and Torres Strait Islander population" (HR Leader1). Senior managers were avoiding "trying to import folks from overseas … it's an expensive option for us so it's just not our first go-to" (HR Leader1). Alternative workforce models were being considered:

> So, we might not have our own [workers] … and, like an Uber model, use someone else to do that … Or do we start that ourselves? Because if it's a large workforce, I don't think we should not consider, over time, almost becoming a labour broker of some kind. (HR Leader1)

The casualisation of the workforce as an industry practice was acknowledged, with workers described as "tourists" meaning "we're not the predominant employer for

many people" (HR Leader3). A strategy to tackle this and convert workers to "fuller employment" (HR Leader1) was underway and was reported as receiving positive responses from workers.

Structural changes to support workers providing the continuum of care from an older person's home, residential facility and hospital were planned. This was viewed as the potential to remove the distinction between hospitality staff, personal carers and activity staff to "have staff that work at the facility and they do it all" (AC Leader4). This would also see the need to provide a single technology platform so that the workforce was not affected by "whether we're delivering care in Mary's home, or whether we're delivering care into a [residential] aged care facility" (AC Leader6).

Technology was seen as a key solution for broader workforce challenges: "I know some people will see technology as a motivator, but I see technology as a hygiene factor … So those people can focus on the part of their jobs where they're adding the value" (HR Leader1). However, the introduction of technology to the workforce raised some concerns due to the perceived lower skill levels and workers who "may not have devices at home and they might not have that experience in how to use a device at work" (HR Leader3). Participants conveyed narratives about past failed implementations where the provider had "lost people because of it" (AC Leader2). The introduction of technology also raised other concerns with some workers:

> Their perception of the good that they do is caught up with the laying on of hands and then talking to the person in person and that kind of connection. Rather than more efficiently, and probably even better for the person in a way cause the person has more control and less invasion [of] their home etc if you do it the other way. (AC Leader1)

However, the importance of valuing the ability to care over technical skills was recognised:

> I've seen people be forced out of the industry at the moment who are just fantastic... So that is an unfortunate side to the technology … how do we accommodate them so they can keep on doing the thing they do so well. (External Industry Leader1)

Generational Expectations as a Driver of Technology Adoption

Most senior managers referenced inter-generational differences between older people starting to receive aged care services and workers entering aged care, as a driver in the adoption of technology. Furthermore, generations were seen as having differing expectations of services that incorporated technology.

For older people receiving care, most discussion centred around the 'Lucky Generation'[1], and 'Baby Boomers'[2]. The Lucky Generation was described as "very people-focused, they want human beings" (AC Leader5) with the expectation that "technology doesn't take away from the conversation" with a worker, and that "the eye contact is there and they're not playing on a device" (AC Leader3). The Baby Boomer generation was described as having higher expectations and a more demanding attitude, such as: "'We need it. We want it. We want it now, not yesterday'" (AC Leader4). The shifting expectations were identified as a challenge:

> I mean, the challenge we face and we've been facing for probably the last five or so years is we're sitting a little bit in between generations so we're still dealing with the older cohort, who are not tech-savvy, very much thankful for the care that they get and so forth. Versus Baby Boomers coming through who

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[1] 'Lucky Generation' generation were born before 1946, and aged over 75 at the time of interview.
[2] 'Baby Boomer' generation were born between 1946 and 1966, and aged between 54 and 74 at the time of the interview.

know what they want, how they want it. They will integrate very differently, they're very tech-savvy. (AC Leader2)

For an older person, adapting to the change in technology use was considered to have a health impact as "the more change, the more disruption, and the less likely that person will stay at the same level of care; they'll actually decline" (AC Leader5). However, another senior manager challenged the matching of technology to the generation, suggesting that technology was lagging "because there's a bit of an ageist view of whether people would cope, but there is also a reality of accessibility for some people" (AC Leader1). Examples were given of "90-year-olds who are quite tech-savvy" (AC Leader4) and "one man didn't know what a tablet was [who became] the poster boy for a care technology program because he just adopted it that quickly and was very engaged with it" (AC Leader1).

For the workforce, the challenge was described as the organisation having an "ageing workforce" (HR Leader1), where "people have a bias around technology" due to "our average age of employees is about 55" (HR Leader3). With younger people entering the workforce, the tensions between the different generations of workers was described:

> Some of our employees could probably feel not just disempowered, but vulnerable. Because if you look at some of the youngsters how fast they can do this stuff, I mean you can't even keep up. You feel inadequate, you start feeling dumb and slow. You probably know when you text your kids, you're still busy answering the first question and they are already sending another three. (HR Leader1)

Not all older workers were disadvantaged when introducing technology with the acknowledgement that "the reality is that most workers have got more modern phones that what we have" (AC Leader1).

Future Technology Investment

Senior managers identified several new technologies when discussing their key drivers to adopt technology in the future and to realise their perceived affordances of technology (identified in the Affordances Provided by Technology section below). Care and workforce-management technologies included a client and family portal; monitoring and sensor technology; videoconferencing for telehealth and case conferencing; robotics for care delivery and removing physical effort; and drug administration technology. Future technologies included enhancements to current technology, technology hardware and infrastructure improvements to network connectivity, and a shift to cloud computing; and workforce-enabling technology improvements to the scheduling and rostering of workers. A summary of the new technologies being considered by senior managers is provided in Appendix E.

Information on future technologies came primarily from two sources; technology vendors, and aged care industry bodies, the most referenced source of information being software or robotics vendors who presented at conferences or were willing to invest in pilots within the organisation. A shift in marketing efforts was also noted in the way technology providers have begun marketing to the older person and their families "because that's the consumer-directed world" (AC Leader1). Some industry groups were identified as working in partnership with Universities. However, frustration was expressed over the Australian Government's Digital Health CRC in stifling innovation as well as the prolonged time taken in academia to research

technology and bring it to the market; "technology is moving at a faster pace than the research can actually keep up with it." (AC Leader1).

As outlined in the Affordances Provided by Technology section below, senior managers identified several outcomes of technology which had not been realised and a variety of technology solutions to achieve the goal of caring for older people. These outcomes included improving the efficiency of operations and care delivery, the quality of care, and organisational sustainability. Despite this, senior managers indicated that there was little consideration to investment in technology over the next two (2) years. A ten (10) year strategic plan was in development that focussed on a "fix and pivot" approach to "set the foundation for us to then hopefully remain a lot healthier" (HR Leader1). Within this plan, technology was described as "supporting us to get where we need to get to and it may enhance where we end up, but it won't drive our strategy, it's an enabler" (AC Leader7). Instead, the focus for technology was on fixing "the basics and building the right IT core" (Technology Leader1). Most participants articulated a similar sentiment to the following:

> I think there's a lot of people who feel quite disappointed with that because I think fundamentally unless you get on the bus you're actually going to stay at that bus stop and fall behind further and further. And there's a lot of things that are baseline things that we can't have because we don't have technology. So that's frustrating and it's then generating costs and loss of productivity and all the rest. (HR Leader3)

In the conversation about rapid technological change, senior managers still emphasised that "we're not going to just chase technology for the sake of chasing technology because we understand the importance of the human touch or the personal touch in our environment" (HR Leader1). Beyond the next two (2) years, participants

indicated they would be focussing on "being more effective with the systems that we have" (AC Leader6) and doing "enhancements to what we've already got" (AC Leader5).

As a significant footnote, the end of the data collection phase of this study coincided with the commencement of the first wave of lockdowns in 2020 due to the global COVID-19 pandemic. At that time, the rapid adoption of technology was starting to become evident to participants. As one participant stated, the pandemic was "assisting with forced innovation" (External Industry Leader2). Immediate innovations included "using Zoom technology" (External Industry Leader2) as a communication tool; "online health clinics or pop up clinics" (AC Leader7) to assist with remote health monitoring or telehealth; and capturing data to "assess who's carrying it, who's got it, who hasn't so that we can then implement the right practices" (External Technology Provider). For the worker, one senior manager from industry observed "the actual remote worker plus the modality of working will change completely." (External Industry Leader1).

Affordances Provided by Technology

This final section addresses the research question *'From the perspectives of senior managers, what affordances are provided by technology and to what extent have they been realised?'*. Senior manager perceived affordances are identified, along with their level of realisation, future technologies being considered and expected longer-term affordance outcomes. This is followed by findings that capture some of the unintended consequences of affordance realisation.

In the context of this study, perceived affordances are the possibilities of technology to influence new behaviours or actions in relation to the goal of caring for older people. For ease of reference and understanding, they have been grouped by

management function with three (3) perceived affordances relating to management of data, four (4) perceived affordances relating to the management of work activities, and four (4) affordances relating to the management of organisations. The level of realisation for each perceived affordance is described to provide the opportunity for exploration of the consequences of implementing technology on the goal of caring for older people. Within the study, senior managers identified only two (2) affordances that had been realised; the capture of data, and access to data, with the rest either partially realised or not yet realised. For the longer-term, senior managers identified three (3) affordance outcomes, namely efficiencies of care and operations, quality of care, and organisational sustainability to meet their goal of caring for older people.

A summary of the perceived affordances, their level of realisation, and the expected affordance outcomes, grouped by management function is presented in Table 4.2.

Table 4.2

Senior manager perceived affordances, their level of realisation and affordance outcome, grouped by management function

Management function	Affordance perception	Affordance realisation	Affordance outcome
Management of data	Capture of data	Realised	Efficiency of care and operations Quality of care
	Access to data	Realised	Efficiency of care and operations Quality of care
	Distribution of data	Not yet realised	Efficiency of care and operations
Management of work	Organising of services	Partially realised	Efficiency of care and operations
	Replicating human tasks	Partially realised	Efficiency of care and operations
	Autonomy of work	Not yet realised	Efficiency of care and operations Quality of care
	Mobility of workers	Partially realised for community care Not yet realised for residential care	Efficiency of care and operations
Management of organisations	Assurance over work activities	Not yet realised	Efficiency of care and operations Quality of care
	Attraction and retention of workers	Not yet realised	Organisational sustainability
	Competence of strategic development activities	Partially realised	Organisational sustainability
	Connection between humans	Partially realised for workers Not yet realised for older people	Efficiency of care and operations Quality of care

From the perspective of senior managers, technology afforded the management of data by allowing the capture, access and distribution of data; the management of work affordances of organising of services, replicating human tasks, working autonomously and worker mobility; and the management of the organisation affordances of assurance over work activities, attraction and retention of workers, competence of strategic development activities and connection between humans.

The technology affordance to capture data was realised through current technology, with possible further realisation of this affordance through future monitoring and sensor technology for capturing health data and improvements to the accessibility of residential client management system. The affordance of access to data was realised with monitors and sensors, and improvements to the client management and business intelligence system leading to further improvements in the data available when providing quality care. However, the affordance of efficient distribution of data had not been realised. The implementation of future technology was being considered to support interconnectivity both from within and external to the organisation.

Organising of services was partially realised by current technology, with future investment planned to improve the scheduling of specific workers with older people, and in the reduction of travel time. Replicating human tasks was also partially realised with several technologies being considered to replace or augment worker activities with a view to improving workforce productivity. Technology affording autonomy was not yet realised, with improvements to existing technology and new technologies being considered to support self-managing teams and self-service for older people. The affordance of mobility of workers was partially realised for community workers, but not for residential care workers, with future remote care technology and hardware

improvements being considered to realise mobility for the whole workforce to enable care services to be provided from any location.

Assurance over work activities and attracting and retaining workers was not being realised by technology and was not expected in the future. Competence of strategic development activities was partially realised by existing technology, with several investments in current and future technology being considered for faster responses to growth opportunities both within and external to the provider. Finally, the affordance of connection between humans was partially realised through current technology for workers, but not for older people. Future investments in care robots, client and family portals, and the client and workforce-management systems were being considered to realise connection for older people, however, none was being considered for workers.

Each of the perceived affordances, whether they have been realised, and the longer-term affordance outcomes, are described:

Management of Data

Senior managers identified three (3) perceived affordances of technology relating to the management of data. These included the ability to capture data, have access to data, and distribute data from a variety of sources both from within and outside the organisation.

Capture of Data

Existing technology afforded the ability to capture and store data electronically. Current client management and risk management systems enabled the capture of care plans, health data about the older person, review and assessment notes, incident management information, compliance data required for reporting, and clinical indicator data. Collecting data electronically was identified as making data entry easier

"because they just touch tick" (AC Leader3) and faster because workers are now "able to record on the spot what was happening" (Technology Leader1).

Participants also referred to improved data accuracy as workers enter their own notes without needing to be interpreted or entered twice. For example, GPs would previously request residential care workers enter their (the GP's) client notes and expect workers to "try and represent what the GP was saying" (AC Leader5). Now, GPs enter the data directly themselves. Audio-visual technology such as taking photos or videos using a tablet also enabled workers to capture, analyse and share health data over time so they could "look at the change together" or alternatively, discuss whether change had not occurred and if necessary "refer off to GPs." (AC Leader5).

The use of fingerprint scanners that captured shift and service start, and end times for payroll and billing systems, improved the efficiency of administrative tasks for frontline workers and improved the accuracy of billing information. Job logging systems that captured repairs and maintenance data for residential facilities also allowed operational tasks to be performed faster.

Future technology being considered at the time of the interviews included the capture of an older person's health and movement data with monitors and sensor devices. Examples include wearable devices such as "fitness trackers and their heart rate monitors and pressure monitors", location monitoring devices for "patient tracking" and "fleet tracking" (Technology Leader1), and smart home technology that "monitors when you turn lights on and off, when you make a cup of tea, when you open your fridge, when you use the bathroom" (AC Leader7). Artificial intelligence that analyses home monitoring systems would then "set a base level of activity, what's normal in that house, and flags an alert when things change" (AC Leader7).

New monitoring and sensor technology to capture data for an older person in a residential facility who "might be a bit prone to falling" (AC Leader4) was being considered because it was viewed as more effective than sensor mats on the floor or at the back of the bed. For community care, monitors and sensors were viewed as more effective at capturing data than existing fall detection devices. This was due to their portability with older people who forgot to put on pendants or other alarm buttons and then fell "and they're there for three days waiting for someone to come" (AC Leader4). The capture of data via smart devices such as these was also considered advantageous in minimising disruption to an older person in their home: "It's quite draining when people… come into their homes every day." (AC Leader2).

Improvements to the accessibility of residential client management systems would also see improvements to existing data entry time limits where:

> You've got to go at the end of the shift and go enter [bowel movements] all at the one time. So, we've got the whole state, the whole state in [client management system] at the one time doing bowel lists! (AC Leader4)

In summary, senior managers perceived the affordance of capturing data as being realised by existing technology such as the client management and risk management systems, fingerprint scanners and job logging systems. Technologies led to more efficient operations and improved care provision. Future technologies being considered for this perceived affordance include the use of monitors and sensors to capture additional health information and provide comprehensive data points to improve the efficiency of care, as well as improvements to the accessibility of the residential client management system to allow timely data entry.

Access to Data

Senior managers believed technology afforded greater access to data. Allowing a worker to access up-to-date information from a single point of reference in the client management system was described by one participant as giving "access to information quicker than in the past" (AC Leader5). Introducing technology to replace paper-based records removed the need for community care workers to physically carry documentation "in their car boots" (AC Leader2). This allowed a worker to prepare for their visit and to "more effectively report on a client's care… and also their trajectory of care" (AC Leader5). Similarly, the connectivity by mobile devices and applications by allied health professionals enhanced the ability to "access additional services" (Technology Leader1).

Easier access to client information also allowed for more accurate planning of residential and community care worker rosters which optimised worker skills to ensure the right worker was available at the right time:

> So, you start doing things like working out, cause of the data you can draw out of systems, that you need this many of this type of staff member in this type of location. Or the palliative care nurse needs to be there for this many hours or whatever. Because you can actually get good real time data out of the system. (AC Leader1)

Senior managers perceived that the visibility of data that technology afforded gave workers a holistic view of an older person's health and wellness information from all service providers and health monitoring devices in use for that client. For example, a senior manager believed clinical teams having data on hand at the point of care meant: "We can monitor and work with the more clinical teams like GPs and specialists to ensure that it's a holistic and integrated service that we're providing."

(AC Leader3). As one participant put it "we have this one stop shop that gives you such a great picture of how that client is living life better." (AC Leader5). Access to a single source of data was also ascribed greater levels of trust. For example, capturing an older person's food allergies and then allowing the kitchen staff access to search and view allergy data when preparing meals was preferable to allergies being "written out and delivered to certain places" (AC Leader5).

Increased searchability of the client management system provided frontline workers the ability to plan care services with an older person more effectively by enabling workers to have "constructive conversations at the point of care about what's next" (AC Leader5). Planning services with the older person contributed to the strategic goal of "enabling our customers to be as self-sufficient as possible" (HR Leader3) and aligned with the reablement requirement to "stop doing for, do with" (HR Leader2).

For senior managers, the current business intelligence system provided a set of dashboard reports from a data warehouse that provided senior managers a "single view of the customer across the whole organisation" (AC Leader1). Greater access to data enabled the provider to support an older person so that "transition between this and respite care or residential care is all … seamless" (HR Leader2). External reporting on care provision was "becoming more and more onerous" (HR Leader1), with "a whole raft of stuff that we do as a reporting requirement within [the provider] that needs to be fed into a whole lot of bureaucracy in government systems that we actually get our funding for" (AC Leader2). The importance of providing data analysis tools and reporting functionality for providers was recognised by technology vendors; "we're embracing the business intelligence apps that are out there to give them more reporting capability and control" (External Technology Provider).

With improvements to client management systems and internet accessibility planned, senior managers explained that the increased searchability of information would provide a community care worker with the ability to further personalise their approach to meet an older person's preferences. These technologies would also ensure "you get more out of your time with the person, you're not repeating the same questions" (AC Leader1). This provides "more time then to analyse the information as opposed to preparing and collating it" (External Technology Provider).

Future investment in health data from monitoring and sensor devices, such as wearable devices, was also planned to inform the worker "so that when they go in they'll have a fair idea about what a person's health is like rather than actually going in and asking the questions and assessing it while they're there." (AC Leader1). Some monitoring technology was also identified that "starts picking up patterns and starts seeing if someone's gait has started to change, and you know where their risk profile goes up" (HR Leader1). Workers could then determine intervention treatment. This was also perceived as alleviating family pressure where "the ability to be able to remotely keep a track of Mum and Dad through various monitoring devices is a pretty powerful notion and the technology is gradually getting there" (AC Leader7). These technologies were predicted to become more common in aged care as the ability to keep people living at home longer improved and their ubiquity increased in society more broadly.

However, some participants expressed negative sentiments about the plans to capture additional data from remote monitoring and sensor devices, and questioned whether the increased visibility of data would detract from the quality of care: "Because is that [use of remote monitoring] just so that I can take my attention off that group of people and I can go somewhere else and do something else and not be present

with them?" (AC Leader5). Questions were also raised about the capacity of workers to search and analyse the information:

> They have all this information being generated, multiple data points, multiple customers, multiple times a day, but what do you actually do with it? Who's monitoring it? Who's interpreting it? And what do you do with it? (AC Leader7)

In summary, senior managers perceived the affordance of increasing access to data had been realised by the current client management and business intelligence systems. This was seen as improving the efficiency of care provision, as well as the perceived quality of care being provided. Future technologies being considered to realise this perceived affordance include the improvement of the current client management systems, business intelligence system, internet access and remote monitoring which are all expected to provide increased access to an older person's health information. Despite some negative sentiment surround the potential impacts of remote monitoring and sensors, senior managers identified that the opportunities to capture more comprehensive data points would further improve the quality of care provision.

Distribution of Data

Senior managers discussed opportunities for technology to afford more efficient distribution of data to relevant stakeholders. This was also referred to as interconnectivity or interoperability of systems. This automation of data flowing between providers and with government avoided the current manual extraction and transfer of data. The exchange of data between organisations would avoid "scenarios where there are multiple providers [and] multiple folders … instead of having a central

repository of information so you can cross-pollinate" (External Technology Leader2).
It was also seen as a way of improving oversight of quality across the system:

> And even things like clinical indicators. So if you want to measure outcomes
> and how well the system is doing, the clinical indicator process for us to
> upload how many wounds we've got and what the medication errors are etc.
> all key indicators that we're required to do for compliance is a fairly clumsy
> system at the moment as well, without a good interconnect. (AC Leader1)

Integrating data across multiple systems was expected to enhance reporting
efficiency and avoid workers entering data multiple times across systems: "Whereas
if it was a seamless interface it would just go, schoom, and the data would be dumped
in." (AC Leader1). In this way, technology was viewed as "freeing people up so they
can do the work of leaders and do the work of coaches as opposed to capturers of
information and just writing reports all day" (HR Leader1).

With no current technology to support the efficient distribution of data, this
affordance was not realised. Future technology to realise this perceived affordance to
support interconnectivity both within and external to the provider was being
considered and expected to improve the efficiency of operations.

Management of Work Activities

Senior managers discussed several affordances related to management of work
activities including organising of services, replicating human tasks, autonomy of work,
and mobility of workers.

Organising of Services

The automation of scheduling services for older people afforded efficient and
responsive organising of service provision to older people. With the anticipated growth
in community services and the number of workers being scheduled, organising

services electronically would allow the organisation "to be more responsive to clients and more effective in getting services to clients quicker." (AC Leader5).

The current workforce-management system provided the ability to optimise workers' shifts with unproductive periods such as the reduction of travel time between services. Reducing travel time improved efficiency "so that we're actually maximising the client face to face, but also the travel time in between." (AC Leader5). Safety was also considered to have improved: "the less time our staff have to be travelling, the less risk that there'll be an accident" (AC Leader5). Capturing service start and end times through technology also provided greater visibility of work hours, more accurate tracking of costs of service delivery across the provider, and avoidance of "over-delivery in a lot of areas" (HR Leader2) when workers spent additional time with the older person that wasn't accounted for and costed. This enabled the identification of workforce productivity improvements that could be scaled across the organisation.

For community workers already out on their shift, location monitoring via geo-tracking systems provided insights to senior managers and supervisors to check "whether people went to McDonald's for a couple hours when they should've been working" (HR Leader3). With the rescheduling of services often occurring throughout the day, technology allowed schedules to be updated in a semi-live environment and communicated to workers:

> So, one of the advantages is meant to be that we're able to live feed that information to our staff, which takes away some of the need to be coming back into the office to get updates. So, it's designed to make their day more efficient. (AC Leader7)

However, several limitations of the workforce-management system resulted in the reinstatement of manual scheduling and rostering interventions that led to the

administrative team growing "exponentially in size" (AC Leader6). The system was also not successful in driving consistent practices across the organisation with local practices not changing "to get the benefit from the technology" (HR Leader2).

The workforce-management system also drew some negative sentiment with observations made of community workers interpreting the drive for workforce productivity as needing to limit their time with the older person. Workers were perceiving "the quicker I get the visit done, the quicker I can get to the next one" (HR Leader3), whereas previously "you might have taken another five minutes ... because it was just part of the visit" (AC Leader2). As a result, some staff were observed to be "feeling really pressured" and "really rushed" (AC Leader4).

Improvements or replacement to the scheduling and rostering technology within the workforce-management system were being considered. This included technology to analyse residential worker movements to identify optimal movement around a facility and improve operational efficiency. However, the key focus of improvements was on the zoning of community staff to match workers to the needs of older people and providing more roster information to workers and enabling self-managing teams. Zoning of community staff was aimed at improving worker efficiency and productivity, as well as providing a "regular cyclical group of staff" (AC Leader5) for a group of older people in an area to establish and build relationships between older people and workers. The extent of the challenge within community was illustrated by the following comment:

> The biggest deficit in community support is residents or clients not always knowing who's coming to be their support worker, what time exactly they might be coming. So, it'll save us, everybody a whole heap of pain. (AC Leader5)

In summary, senior managers indicated that the affordance of efficient and responsive organising of services had been partially realised by the current workforce-management and geo-tracking systems. Although some senior managers described these technologies as increasing the efficiency of operations and care provision, several others noted that in fact, it reduced efficiency of operations. Future investments in the existing workforce-management system to realise this perceived affordance were being considered to provide efficiency of organising work activities and to achieve greater efficiency of care provision. Investments were also perceived to afford human connection with the ability to build relationships between workers and older people (as discussed in Connection Between Workers and Older People below).

Replicating Human Tasks

Senior managers identified technology as being able to replicate human tasks and replace or augment a worker. Technology was perceived as providing greater efficiency of operations and care whilst potentially also improving the quality of care:

> So that's where we see tech can start playing a role when people can free themselves up more to do the work they do to add that value and not be wrapped up in administration which takes them away from the whole reason they're there. (HR Leader1)

Current technologies such as client management and financial management systems were identified as augmenting a worker to improve the efficiency of operations by streamlining processes through automation. For example, capturing accurate customer charges for billing information and sending this through to the financial management system streamlined the numerous manual tasks previously performed. Current maintenance systems were also enabling more efficient operations by augmenting workers:

But if I was out there at the moment, and something was to break, I would

absolutely phone the 1-800 number. A centralized point of call, which they

would then activate all the electronic reporting to see who I would refer that

[to], so I'd have somebody out to fix, which was all done manually in the past.

(AC Leader5)

Apart from replicating the human task of managing data, and automating some administrative processes, little existing technology augmented or replaced workers. Instead, senior managers considered replacing workers with process automation technology, or care technologies such as the automation of drug administration, the use of robots to replace physical effort, and using care prompting technology. Process automation was seen to improve operational efficiency by providing the ability to outsource some functions which removed administrative tasks or the ability to provide services at scale across the organisation. As described by one participant:

So I'm talking about large volumes, repetitive tasks, lots of transactions

whereby processing hundreds of thousands of records of similar, I guess,

nature, the robot or the algorithm can learn and they can, by exception, they

can understand what norm is and what exception is, how to treat exception,

and if they can't deal with the exception, they'll raise it with a human.

(Technology Leader1)

To replicate care delivery tasks, drug administration technology being considered would monitor, for instance, the number of tablets removed from a drug packet, identify when a new script was required, and place orders so that "the medication just turns up" (AC Leader1). This investment would replace "the handwritten medication chart" (AC Leader5) and remove the physical counting of pills. This was seen as a reliable way to "ensure that a particular person always gets

the right medicine" (Technology Leader1) and "make it really easy to see if there were any missed signings or whatever really quickly" (AC Leader4). Reliance on "people's understanding and reading through the screen and what pill I need to take." (Technology Leader1) is avoided, especially for people with memory loss or dementia.

Robots were being considered to replace physical effort by workers in care delivery. This included mechanical robots to deliver meals and linen to care areas, and hover mats to allow a worker to "move a 200 kilo client with the manual handling lift of 20 kilos" (AC Leader4). Within residential aged care, robots had the potential to "really help with a lot of manual handling issues with our staff" (AC Leader4). Although robots could potentially decrease older people's feelings of loneliness, impediments to their use in residential facilities included the physical design of the building and the desire to ensure "we don't want to set up residential facilities where the robot has right of way, or even takes up the bulk of the corridor and people have to work around them." (AC Leader1). Within a community setting, participants identified opportunities for an older person to use robots within their own home including "assisting people to ascend the stairs" (AC Leader4), vacuum the house, and clean the windows. Participants identified that technology did not need to be designed specifically for the aged care workplace:

> So the technology might be home everyday technology, but if you could put
> it into your service model in a way that it transforms what you do that brings
> you greater efficiency, that's where the winner is. (AC Leader1)

Improvements to care prompting technology such as alarms and alerts were also being considered to alert workers to a health event that either required an immediate response or could be anticipated in the future:

It just will let you know that they're likely to urinate every two hours or every one hour or every whatever so that you can assess the type of continence aide and the frequency of changing and number of aides that they would use in a day. (AC Leader4)

However, this technology received some negative sentiment and was perceived as having some risks, with a senior manager receiving feedback from a group of community aged care workers: "they're not a big fan of the alert system because when the alert goes off, we have to act on it. And more often than not, the alert is a false alert for whatever reason." (AC Leader7).

In summary, senior managers indicated that the affordance of replicating human tasks had been partially realised through current client management, financial management and maintenance systems. These technologies were viewed as increasing the efficiency of operations by replacing administrative tasks. Several future investments in process automation, drug administration technology, care prompting technology, and robots to replace/augment physical activities, were being considered to realise this perceived affordance and provide greater opportunities to replicate human tasks. The expected result was greater efficiency of care provision and worker productivity.

Autonomy of Work

Senior managers afforded technology the ability to enable worker autonomy by supporting self-managed teams and self-service, as well as older people's autonomy in selecting their care services. Self-managing teams was a workforce initiative being considered by senior managers which aimed for more efficient and effective teams, and "means we need to have the staff being able to do all of this stuff, whether that be

scheduling, rostering, whatever, themselves at the frontline to minimise that back of house function" (AC Leader2).

Specific improvements that were being considered for the workforce-management system's rostering technology were expected to provide care workers with greater autonomy to "see what their run looks like at least four weeks in advance" and enable them to "upload their own profiles and preferences" so that workers don't feel "that it's a one-way relationship" (HR Leader1). For all workers, senior managers were considering employee self-service technology to enable efficient updating of personal details, access to pay data, and the ability to submit queries without the need for support.

Future investments in self-service technology, such as client portals, were being considered to help older people "make choices" (AC Leader5) about the services they would receive in order to improve the quality of care they received. For those receiving community care services, the technology would give them updates on how far away a community worker was from arriving at their home. It would allow them to "view their bookings, change their bookings, put in requests to carers", and for the provider to "send updates around scheduling of services or movement of services" (AC Leader7). For older people in residential facilities, self-service technology would provide "access to streaming services, access to being able to order meals, drinks, outings, haircuts, online using a tablet or something like that" (AC Leader7).

Artificial intelligence within self-service technology could also tailor services, for example "Alexa can learn about their likes and dislikes and provide content through that" (Technology Leader1). The provider was trialling tablets for clients to provide the client portal. This technology was seen as important in the "consumer-driven and directed environment" (AC Leader2) of aged care, as it would "give consumers the

control" (AC Leader2) over services being received and provide "greater transparency in what it is that they could access and request" (AC Leader6).

In summary, senior managers believed that the potential to provide greater autonomy to workers and older people had not yet been realised by technology. Future investments in self-service technology, as well as improvements to the workforce-management system were being considered to realise this perceived affordance and to further improve the efficiency of operations and the quality of care.

Mobility of Workers

Technology afforded greater mobility of workers by enabling community and residential workers to deliver care services from any location. Greater mobility of workers was seen to significantly improve the efficiency of care delivery and the ability for frontline workers to access information "at all different times of the day." (AC Leader1).

For community care, this mobility meant that workers no longer needed to physically return to the office. Client management, workforce-management, and online training systems, removed the need to physically access client files, worker schedules and rosters, and participate in training. Instead, workers went "back to the office on a weekly basis rather than starting their shift at the beginning and ending the shift at the end of the day" (AC Leader1).

However, managers believed that mobility negatively affected workers' engagement with the organisation and each other and increased their feelings of isolation:

> Particularly the nurses and allied health are probably the ones that have felt
> the most about that mobile workforce. You know, moving from being
> connected with their colleagues on a day to day basis to now having to connect

over a device or meeting up with their team once a week or whatever. That's

… been a challenge for that workforce. (AC Leader2)

The delivery of annual mandatory training online, except for the physical activities within modules, also attracted negativity. One senior manager wondered whether online training was appropriate given the learning styles of some workers:

Because I'm a practical learner myself, so I like to be able to think, "Well okay they said that, but how do I apply that?". And there's no opportunity to ask those questions when you're doing a one-dimension kind of training. (AC Leader4)

The clinical management system also drew some negative comment with "some clients don't like staff using the devices when they're in the home … so the staff will go out and have to do it in the car" (AC Leader4).

Participants also noted that paper-based processes still existed with a paper-based version of the older person's support plan placed in their home for "reliability" and "so the client knows what they're looking at" (AC Leader5). Furthermore, for residential files, the "very thick walls in our buildings" (AC Leader5) did not allow Wi-Fi to support the use of tablets, requiring data entry to be paper-based.

Future investments in mobile technology for residential workers was being considered with the goal of having Wi-Fi work well and "move to a more portable system so that we can be present with the client." (AC Leader5). This included the use of tablets to enable residential workers to move throughout the facility without the need to return to a nurses' station to use the computer. Key considerations for network connectivity were the age and design of buildings in all locations that inhibited the use of Wi-Fi, and the availability and cost of services in regional and remote locations. For

example, a senior manager contrasted their experience in residential facilities before the introduction of technology and future ambitions:

> I suppose there was times with the paper-based system where you might take a folder down to a client's room and sit and have a chat to them… a goal if we can get Wi-Fi to work well, is to move to a more portable system so that we can be present with the client. Like a tablet form that we could use across the facility. (AC Leader5)

Future investment in remote care delivery and remote monitoring technology was being considered to improve the monitoring and efficiency of care, thus eliminating the need for a frontline worker to be present with the older person. Technology under consideration included video conferencing technologies such as "Skype or FaceTime" (Technology Leader1), and "glass windows and glass walls in houses with your doctor booming in" (AC Leader1). Video conferencing technology was being considered to support case conferencing between rural and remote workers with specialists and doctors "around a resident or in the home" (AC Leader3). Other opportunities included Physiotherapists and Occupational Therapists communicating via video conference with personal carers, and telehealth workers or directly with the older person.

For a large organisation providing services over a wide geographical area, remote monitoring and care delivery technology improved the efficiency of care by reducing travel time, thereby increasing the time available for a worker to provide care:

> It comes back to a technology play of 'How do we get our staff in front of our customers using technology without having to drive them all over the countryside?'. Now, you can't ever replace face-to-face care 100% of the time, but there are many visits where you can do that. And there are certainly other

players that are entering the market that are doing that. And I think we are way

behind in that space. (AC Leader7)

In summary, mobility of work was partially realised for community workers who used mobile devices for clinical management, workforce-management and online training technologies. However, this affordance was not realised for residential care workers who were required to capture information on non-portable technologies or on paper, away from the point of care delivery. Senior managers were considering future investments in Wi-Fi and mobile device technology to realise this perceived affordance of mobility for residential care workers. Future investments in remote care delivery technologies were also being considered to improve the efficiency of all care delivery.

Management of Organisations

Senior managers discussed several affordances related to the management of organisations including assurance over work activities, attraction and retention of workers, competence of strategic development activities, and connection between humans.

Assurance Over Work Activities

Technology afforded greater assurance over work activities in the aged care work environment. An industry senior manager observed that compliance with quality standards was a crucial consideration for the next one (1) to three (3) years and "what should be happening is an organisation's process should generate compliance" (External Industry Leader1). This comment inferred the use of technology to assist in meeting compliance requirements, not just with the reporting of compliance data. A senior manager from within the provider reinforced this view from the perspective of the older person and their family, claiming that older people were getting better quality

care because services were "more accountable than before technology." (External Industry Leader2).

By capturing and reporting incidents and supporting the management of risks, existing client management and risk management systems enabled the partial realisation of assurance of work activities. However, although the efficiency of risk reporting improved to a certain extent, the cost of licences limited the number available to staff. Limited access for workers meant "we've got to wait until somebody enters it into the system" (AC Leader4) before it can be actioned, and both community and residential workers "have to go into the office to do it on the desktop" (AC Leader2). Another participant expressed frustration with the need to use both the client management and risk management systems because incident information needed to be entered twice without an "automatic update in both systems" (AC Leader2). This risk management system drew further criticism as "it keeps dropping out … so their ability to do their job efficiently is inhibited" (AC Leader3).

With no process automation within these systems and problems with accessibility, the full realisation of technology affording assurance over work activities to improve the efficiency and quality of care was not achieved. Senior managers did not indicate they were considering any future investments in technology to realise the perceived affordance of assurance over work activities.

In summary, providing assurance over work activities was not realised by the provider's current client management and risk management technology. Frustrations with the useability of the systems prevented the optimal use of technology to gain assurance over work activities and realise greater efficiencies and quality of care. Instead, with no future technology plans, only the affordances of capturing and

providing access to compliance and risk data was realised (similar to the capture and access to data affordances above).

Attraction and Retention of Workers

With a competitive marketplace for workers, shifting demographics and higher expectations by workers (discussed in the Drivers of Technology above), senior managers afforded technology the ability to attract and retain workers by enhancing the workers' experience in the work environment. Technology was viewed as enhancing this experience by ensuring workers had "access to the information and the tools that they need to be able to do their jobs" (AC Leader3). Providing technology that gave all front-line workers information about the older person and the services required before they started providing care was considered to elevate the skills required of the worker, making the role more attractive and a better experience "because they feel empowered, they're not just there for just doing their daily chores" (HR Leader1). Enhancing the employee experience through technology was also identified by most senior managers as a key driver to improve the customer experience:

> The relationship is that our staff are the ones providing the service to our customers. So, it needs to be a positive and valued service or product that they're providing that is contemporary, best practice and high quality. (AC Leader3)

For community workers, existing technology which enabled the attraction and retention of workers included equipping workers "with a car, an algorithm, their mobile application or a tablet application, and obviously a book of customers" (Technology Leader1). However, on the whole, the existing technology landscape drew negative sentiments from participants with a recent survey of workers on the use of technology identifying "that of the people participated in the survey, we're actually

bottom decile, not even quartile in terms of rating us on how well we're doing in that [technology] space" (HR Leader1).

Technology was acknowledged as important in attracting workers into remote areas where "technology will likely start coming into play" (HR Leader1). Generational differences were also observed within the workforce with "more tech-savvy youngsters coming into the workplace" (HR Leader1) and the need to engage younger workers through digital workplaces and collaboration tools: "So, the Workforce Solutions are these types of things that the millennials of the world are used to, they're used to Instagram, they're used to Facebook, they're used to social media" (Technology Leader2).

Some senior managers raised concerns that a lack of technology could result in losing new staff who work for multiple providers "because employees, if they're working for others as well, they'll go, "But when I worked for this outfit, I've got this real schmick kind of tech. Why don't we have that?"." (HR Leader1). Compared with other providers, some senior managers indicated "the kit that we supply our staff is not what I would call contemporary" (AC Leader2). Another senior manager described this misalignment as a challenge in fostering innovation in the workforce:

> I reckon that's what we're seeing, that those that said, "You know what, this is nuts. I'll check out early." Versus those that have got to a point going, "Oh well, it's broken. I'll just stick with it. So be it." Which then for me calls out, we've got a secondary issue with that workforce that doesn't necessarily look to innovation, doesn't necessarily want to challenge what's best for them and what's best for the client. They just turn up. (AC Leader6)

Very little investment in future technology to realise the attraction and retention of workers was described, apart from improvements to the workforce-management

system. Described as providing more power to the frontline worker, improvements would provide faster access to worker schedules "so that staff would know when they started and know when they finished so they could plan life outside of work as well" (AC Leader5). Reference was also made to other human resource systems which support self-service to enable frontline workers to self-select available work and provide them with more control over the care work they performed:

> If you imagine the future where someone who is certified, like a nurse or a worker, can work part-time or would like to work part-time or would like to have flexibility to work with, say, four hours on a Monday and four hours on a Tuesday afternoon and then full Wednesday and full Saturday, we can take that schedule in terms of their availability as an input in the system and schedule their work according to their requirements. (Technology Leader1)

In summary, senior managers indicated the affordance to attract and retain workers by enhancing the employee experience through technology was not realised. Although some improvements to the existing workforce-management technology was planned and a human resource system mentioned, the negative sentiment surrounding the technology environment within the organisation would outweigh the ability to realise the perceived affordance as described by participants to achieve organisational sustainability through technology.

Competence of Strategic Development Activities

Senior managers believed that technology afforded competence of strategic development activities by enabling them to lead an organisation that is more responsive to new services and customers. They described their organisation as not yet ready to respond to the changes in the industry, but were aware that technology would be a key enabler:

We have constantly got new types of opportunities coming through that are outside of our normal business lines. How we set those sorts of things up in systems and stuff is quite clunky at the moment. We need those sorts of systems that will be very responsive. (AC Leader2)

For example, existing technology supported the external referral process from government into the provider through the MyAgedCare portal. However, future investments in technology that could support "being able to transition a resident from community through to residential" (AC Leader5) to create internal customer growth were identified. Likewise, additional data that gave deeper knowledge of older people's preferences and needs was identified as a way of being more responsive to new services that would emerge: "The more we know about our resident, the better care that we can provide, the better products and services that we can provide, and the more profitable we become as a business." (Technology Leader1).

In summary, senior managers indicated that although the perceived affordance of competence of strategic development activities was being partially realised by existing technology, new technologies would provide further opportunities. Future investment in gathering customer insights and supporting customer transition through services for internal customer growth would lead to greater affordance outcomes of organisational sustainability in a rapidly evolving industry.

Connection Between Humans

Senior managers believed technology afforded enhanced connections between people, including between workers and older people, between older people and their families and friends, and between different workers. This affordance emerged from the realisation that "culturally, the message that we've sent is one of productivity and efficiency without the care that comes with the relational aspect to the organisation"

(HR Leader2). Discussion regarding mobility of workers has already acknowledged the need to address emerging feelings of loneliness by older people and isolation by community care workers. In this section, senior managers identify technology as being able to build connections between workers, between workers and older people, and in relationships between older people with family, friends, and community.

Connection Between Workers and Older People

Current workforce-management systems enhanced connection between workers and older people by supporting the consistent scheduling of workers providing services (as discussed in the Organising of services affordance above). Senior managers indicated that this consistency and connection helped workers "feel a sense of confidence in undertaking their role because it's nice and it's just continuous" (AC Leader5). It also gave older people "confidence in knowing I've got these people and they actually know who I am, they know what my points of pressure are or my points of issue" (AC Leader5). This consistent connection, together with the availability of data from the client management system before visiting an older person, enabled the worker to personalise their approach according to client preferences and needs. The wearing of "less-clinical" looking uniforms, and the replacement of paper-based records with small mobile devices removed the need for community workers to carry the "great, black clipboard" (AC Leader5) and made their visits to older people "less invasive" (AC Leader1).

The matching of workers to older people was considered problematic within residential care, with senior managers indicating the technology to match workers within facilities was more focussed on supplying data that enabled more efficient rostering of workers. However, it was still acknowledged that there was a holistic focus

on quality of care by organising "your staffing mix in a way that actually meets the goals of each client" (AC Leader1).

Future improvements to the workforce-management system were being considered to provide further opportunities to increase connection between workers and older people. Although already in place, improvements to the workforce-management and geo-tracking systems were being considered to allow automated zoning of community workers and the better matching of "the carer and their interests with the client" (HR Leader2). Pilots were being considered to support "profiling our staff so that clients can actually see who is coming" (AC Leader2). Enhancements were seen to overcome limitations of human interventions of scheduling which matched community workers with older people based on clinical needs rather than connection:

> It was harder to get the right match of the client to the staff consistently and the services were probably run through a hierarchical medical kind of approach where it was the nurse running the services. (AC Leader1)

Future investment in robots to support care delivery by creating connection between workers and older people was also considered. This included animals robots, for example seals that satisfy a "tactile engagement" (AC Leader5) need for some people and provide an opportunity for a worker to "get to know that client more" (AC Leader5) through, for example, "Pepper, who is the little robot that toddles along and has a conversation with people" (AC Leader1). Participants who identified robots being used in the future made a point of explaining how robots augment, not replace, a worker:

> [Robots are] not a replacement for human contact, and so we want to use it in a way that facilitates greater engagement in a person to person, and are person

centred. So around that person's interests and needs way, rather than seeing

we can use a robot, or a seal, or whatever else it is as a replacement for poor

staffing numbers or whatever. (AC Leader1)

The investment in robots also drew some negative sentiment, with senior managers expressing their scepticism of robotic toys for older people which were seen "as a replacement for poor staffing numbers" (AC Leader1) or "reduc[ing] staffing hours by another half hour" (AC Leader5).

Connection Between Older People and Their Family, Friends, and Community
Future investment in client and family portals which enable older people to access information and communicate electronically was being considered to increase connection and decrease loneliness and social isolation of older people. A client portal, as described by senior managers, affords autonomy (discussed previously) and connection by "matching the carer and their interests with the client" (HR Leader2) and "really enhances our ability to connect with our customers, which is probably our greatest challenge in terms of, I guess managing that community side of the business." (AC Leader7). This technology was also seen to support an older person's entry into care and helped to "connect them to the right people, the right types of care and the right type of personnel" (AC Leader2).

As an extension of the client portal, a family portal that provides the family of an older person with information about the care being provided, was also being trialled in a residential facility. This technology was described as an "app on the phone" (AC Leader3) used by workers to communicate updates. With the desire to "share those good news stories with families" (AC Leader3) and also to send photographs of the older person to families, this connection with families was viewed as important as "the most guilt-ridden are the ones who complain the most about everything because it's

often they're far away" (AC Leader4). Having this type of technology was also becoming an expectation of families although pressure on its use also drew negative sentiment as "the technology's already there, but we're not grasping it in our organisation" (AC Leader4).

Senior managers were also considering technology to connect older people with communities, including manipulating the client portal to "use the device even like a social network platform to connect with other people" (AC Leader1) and "keep abreast of all of that is possible within the communities that people are living in" (AC Leader2). Online portals were also identified as opportunities to replace or amplify residential activity workers by running "virtual community activities that people can be involved in with a diverse range of avenues, venues, activities." (External Industry Leader2). Within the community setting, opportunities for encouraging "tablets within the home for a time to get social engagement and video conferencing" (External Industry Leader1) were also being considered.

Connection Between Workers

The affordance of creating connection between workers emerged from the realisation of the mobility of workers affordance (described above). Increased worker mobility increased the detachment of community workers to their supervisors and peers:

> I guess the feeling is there's a loss of connection currently between staff and
> organisation because of the technology and the lack of contact without any
> other form of real engagement that has bridged that gap. (HR Leader2)

This was further evidenced by a recent staff engagement survey in which the organisation was "actually seeing people who don't know who their leader is, don't

know who their supervisor is, don't know what their objectives are, and don't know how they contribute to the organisation as a whole" (HR Leader2).

For workers, effective communication with peers was also identified as helping their "professional decision making" (AC Leader3). For senior managers, the need for contemporary communication methods through technology was important to connect workers "with our mission and connect with our values and connect with who we are" (HR Leader1). The size of the organisation also meant that "as we've got bigger and broader management structures, we are less visible to our staff" (AC Leader5). A key observation made by senior managers pointed to feelings of isolation amongst workers, which has led to additional strategies to communicate:

> My goal is to have numerous methodologies of communicating with our guys. So, workplace chat for me is just one opportunity and if a third of the staff take it up, great. That'd be great because that means that we can connect with the third in that way. (AC Leader5)

To realise this affordance, workplace chat technology was recently introduced for workers "to share ideas [of] what's happening" (AC Leader4); by using existing mobile device and camera technologies to communicate with supervisors "for extra advice or supervision" (AC Leader1); by providing "more ability to be able to reach into the world that they're really truly in" (AC Leader5); and by case conferencing with other health professionals. Despite the investment in workplace chat technologies to support workers, participants still observed a desire for face to face communication:

> I mean I think we're still evolving this, but one of the things people really felt, and we still have some services that go back to the office because they actually think that the time they spent in the afternoon with their peers is important for their either professional development or professional resilience. So, sharing...

doing a debrief is critical and people have not managed to convert to all of the technological options for that yet in all circumstances. (AC Leader1)

In summary, senior managers indicated the perceived affordance of connection between humans had been partially realised through existing technology such as the client management system, workplace chat, and mobile devices with cameras. However, without current technology available for connection between older people and their friends, family and community, this perceived affordance was not yet realised. Future improvements to the workforce-management, client management and geo-tracking systems and investment in care delivery robots were being considered to realise further connection and enhance the building of relationships between workers and older people and improve the quality of care. However, the improvement to existing systems and use of robotic animals drew some negative sentiment for residential care where the focus appeared to be more on improving the efficiency of care delivery rather than improving the quality of care and relationships. Investment in client, family, and online portals alongside mobile devices for older people was also being considered to realise the affordance of connection between older people and their families, friends and community. Despite not fully realising the perceived affordance of connection between workers and its emerging importance due to the increased mobility of workers, no further technology was being considered by senior managers to improve the unintended feelings of isolation by mobile workers.

Summary of Affordances Provided by Technology

Senior managers identified eleven (11) affordances of technology to achieve the goal of caring for older people, namely capture of data, access to data, distribution of data, organising of services, replicating human tasks, mobility of workers, assurance over work activities, attraction and retention of workers, competence of strategic development activities, and connection between humans. Of these technology affordances, two (2) were fully realised, with four (4) not realised, and the remaining being partially realised. The introduction of further technology was being considered to address goals that were not yet realised for all except three (3) affordances; the ability for technology to provide assurance over work activities, to attract and retain workers to the organisation, and to enhance connection between workers.

By realising each of the perceived affordances, senior managers identified immediate concrete outcomes from the investment in technology. However, some unintended consequences resulting from automating the schedule of services and increasing the mobility of workers were identified. Senior managers were addressing the disruption to communication by implementing technology to support human connection electronically (discussed in Connection Between Humans above). Increased efficiency in the organising of services also resulted in the unintended consequence of some staff limiting their time with older people (discussed in Organising of Services above). These unintended consequences were described as "probably more severe in terms of experience for the people in the community" (HR Leader1).

Three (3) longer-term affordance outcomes expected from the realisation of affordances were identified by senior managers; the ability of technology to i) gain efficiencies in care and operations; ii) improve the quality of care delivered to older

people, and iii) enhance organisational sustainability to achieve the goal of caring for older people. While several perceived affordances were expected to achieve multiple affordance outcomes, operational efficiency improvements appeared to be the central affordance outcome being sought from technology. The emphasis on operational efficiency improvements was in contrast to the affordance outcome of quality of care provided in the aged care work environment. Ultimately, although the initial affordance was to minimise administrative tasks, the objective was to allow more time for providing care:

> So that's where we see tech can start playing a role when people can free themselves up more to do the work they do to add that value and not be wrapped up in administration which takes them away from the whole reason they're there. (HR Leader1)

Chapter Summary

This chapter presented findings from fifteen (15) semi-structured interviews with senior managers in the aged care sector. Descriptions from participants of the current hardware and infrastructure technologies that support technologies in the work environment indicated it was outdated and not able to support future technologies. Technology was used within the work environment, but pertained mostly to workforce-enabling processes, rather than care delivery.

Secondly, decisions to adopt technology were influenced by the need to move to more efficient community care provision, achieve financial sustainability, overcome workforce shortages, and meet generational expectations of technology adoption. Although several technologies were identified to overcome these challenges, there was little investment in technology being considered within the next two (2) years to allow time for the infrastructure layer of technology to be updated.

Findings show that senior managers' affordances of technology include the ability to manage data, work and organisations through eleven (11) perceived affordances. However, only two (2) of the eleven (11) affordances were realised; the capture and access to data. Future technology to realise all affordances was being planned for all affordances except for three (3); 'assurance over work activities', 'attraction and retention of workers', and 'connection between workers'. This appeared to result from external pressures on senior manager decision making and the focus on only one of three longer-term affordance outcomes; the desire to improve the efficiency of care and operations. The study also uncovered several unintended consequences of technology adoption including the interpretation by workers of reduced time with older people because of the drive for efficiency improvements; and disrupted communication methods for community workers who were no longer required to return to the office. The affordances that were realised or partially realised and the unintended impacts on the work environment shape the aged care work environment. The following chapter discusses these findings to answer the overarching research question of how technology is shaping the aged care work environment.

Chapter 5: Discussion and Conclusion

This study investigated how senior managers working in the aged care sector perceive technology is shaping the work environment. Findings (presented in Chapter 4) show that several workforce-enabling technologies could support the management of data, work activities and organisational functions. From a senior manager perspective, these technologies result in efficiencies of care and operations that shifted the organisation towards more efficient community care provision and overcame the financial, workforce and intergenerational challenges of aged care delivery. However, extant literature (presented in Chapter 2) draws attention to the potential dehumanisation of the work environment and increased stress for workers using multiple technologies (Barnes, 2012; Sävenstedt et al., 2006; Tarafdar et al., 2015). Collectively, the findings of this study answer the research question: *From the perspective of senior managers, how is the introduction of technology into aged care shaping the work environment?*

The following discussion synthesises the findings presented in Chapter 4 and raises implications for government, organisations, and technology developers. The contributions to Affordance Theory are presented, including descriptions of the eleven (11) perceived affordances of technology and three (3) affordance outcomes. Practical implications resulting from the research and the limitations of the study are also discussed and areas of future research are canvassed.

Shaping the Aged Care Work Environment

This study found technology investment in aged care has focussed on capturing and accessing data electronically to replace paper-records and manual processes. Senior managers indicated there was limited financial investment planned for the adoption of technologies to support care delivery and further enable workers. However, this was expected to change over the medium to long-term horizon as senior managers sought to improve the efficiency of the organisation. Drawing insights from these interviews, technology is shaping the aged care work environment in five (5) significant ways:

1. Mobile technologies have disrupted social exchange between community care workers, raising the importance of human connection

2. Slow technology adoption is limiting innovation in aged care providers

3. A short-term focus on efficiency is outweighing a longer-term focus on quality of care

4. Technology has created efficiencies in the work environment, but may not attract new workers into the sector

5. Technology creates 'skills tensions' as worker roles evolve

Mobile Technologies Have Disrupted Social Exchanges

For community care workers, the technology utilised by the provider increased their mobility, but reduced their interpersonal interactions. As portable client and workforce-management technologies were increasingly adopted, community workers no longer visited the office to collect paper-based files. The resultant reduced face-to-face communication with peers and supervisors led to fewer opportunities for social interaction and collaboration. This illustrates the negative impact technology can have on social outcomes (Wang et al., 2020) and explains a significant dynamic in how

technology is altering aged care work environments (Barnes, 2012; Buntin et al., 2011; Kapadia et al., 2015; Mohsen et al., 2019).

Previous studies have suggested changed communication methods and disrupted relationships from technology have the potential to dehumanise the care environment by increasing workers' feelings of isolation (Barnes, 2012; Sävenstedt et al., 2006; Shulzhenko & Holmgren, 2020; Wirtz et al., 2018). Within this provider, alternative communication methods supported by technology were adopted, including 'workplace chat' and video-conference technologies. Although not a replacement for face-to-face communication, these technologies were aimed at reducing worker feelings of isolation and supporting human connection and collaboration. Whether aged care workers would accept this form of non-face-to-face communication to support human connection remains an unanswered question and one that requires further research from the workers' perspective (Shulzhenko & Holmgren, 2020).

Stagnant Technology Innovation

Technology innovation within the provider was stifled by a current reliance on government funding and a lack of competition in the marketplace. Senior managers indicated that financial pressures limited their investment choices. A lack of competition within the sector was described by both the senior managers in industry and within the provider as resulting in an under-stimulation of the need to innovate service delivery. Consequently, there were no immediate plans to invest in new innovative technologies. Instead, senior managers were addressing outdated technology infrastructure and directing funds towards improvements to the foundational layer of technology and upgrades to current scheduling and rostering technology.

The lack of technology innovation by the provider was unexpected given the technology strategies being espoused by government, industry and the Royal Commission, and literature that highlights technologies available to the aged care sector (Aged Care Industry Information Technology Council (ACIITC), 2018; Royal Commission into Aged Care Quality and Safety, 2020b; Royal Commission into Aged Care Quality Safety, 2020). Thus, notwithstanding external encouragement to innovate using technology, internal financial pressures and uncertainty of funding into the future may have the greatest influence on technology investment in the sector. As called for by Højlund and Villadsen (2020), Topo et al. (2012) and Wu (2020), identification of these internal and external tensions contributes a deeper understanding of the drivers behind technology investment decisions. This finding suggests that technology innovation within aged care providers could be stimulated, potentially through greater competition or targeted funding mechanisms from government.

Short-Term Focus on Efficiency Outweighs Longer-Term Focus on Quality

Efficiencies in care and operations were the main outcomes being sought from technology investment, in contrast to improvements in the quality of care for older people. This finding supports research by Højlund and Villadsen (2020) who found the key function of technology was to "reduce complexity in care services" (p. 180). This view sees technology reducing complexity to improve the efficiency of work, rather than a means to improve the quality of care services provided to older people. Within the provider, the immediate attention of senior managers was drawn towards efficiency improvements driven largely by financial pressures, low workforce productivity, and outdated technology infrastructure. For example, the key driver for automating the scheduling of community services was to improve the workforce productivity of community service provision and minimise travel time. Although

automation of scheduling would allow for matching older people and workers together to build relationships and enhance the quality of care, it was not the key driver for investment.

The focus on gaining efficiencies in operations contrasts with government and policymaker expectations that technology should be adopted as a way of innovating care delivery models to enhance the quality of care provided for older people (Aged Care Workforce Strategy Taskforce, 2018; Royal Commission into Aged Care Quality and Safety, 2020a). Senior managers also acknowledged that this view contrasts with older people and their families who were beginning to expect that technology would be used to improve their care quality. Despite this acknowledgement, financial viability concerns were driving technology investment for the purpose of achieving more immediate efficiencies and improvements for the provider. This finding brings into question whether the focus on technology to improve efficiency of the workforce, rather than its effectiveness, meets societal expectations of how we care for our elderly and the quality of care provided (Fleming et al., 2018).

Technology Creates Efficiencies, But May Not Attract New Workers

With future technology investment in the short-term focussed on creating efficiencies within the current workforce, the improved attraction and retention of workers was viewed as a by-product of technology adoption. Senior managers recognised the potential for a technology-enabled work environment to attract younger workers and retain existing workers. Senior managers also described how workers compared employers and appeared to value more contemporary, technology-enabled environments. However, outdated technology infrastructure and financial pressures focussed immediate technology investment on efficiency improvements such as scheduling and rostering of workers, rather than enhancing digital workplaces and

collaboration tools. Despite the anticipated reduction in frustrations arising from improved infrastructure, senior managers did not believe this would enhance workers' experience in the work environment, nor encourage innovation in care provision in any significant way, at least in the short-term.

This was a notable finding considering the workforce shortages acknowledged across the sector (McCrindle, 2017) and within the provider targeted for this research (refer to Context of Technology Adoption above). Predicted workforce shortages have been the subject of significant attention from the sector and strategies to attract workers and reduce the negative perceptions of aged care work within society have been a focus (Clarke & Ravenswood, 2019; Fanning et al., 2020; OECD, 2020; Ostaszkiewicz et al., 2016). Investment in technology is a key imperative identified by the *Aged Care Workforce Industry Council* to empowering the workforce and supporting work practices that enable better care outcomes (Aged Care Workforce Strategy Taskforce, 2018, p. 6). However, with no immediate plans to provide a contemporary, technology-enabled work environment, the findings here raise concerns about the ability of providers to contribute towards sector-wide workforce attraction strategies.

Technology Creates 'Skills Tension'

Technology is creating an environment in which workers need digital as well as care skills. As posited by Leonardi and Barley (2008), when technology enables workers to do new things, tasks and roles frequently change. With forecasts indicating greater adoption of workplace technology, demand for a new type of aged care worker with more advanced technology skills will emerge (Aged Care Industry Information Technology Council (ACIITC), 2018; Priddis et al., 2020; Royal Commission into Aged Care Quality and Safety, 2020a, p. 204). This study supports such a prediction with indications that technology is likely to change the role and skills required of

workers in the medium to long-term in three (3) ways: workers will work more autonomously, be more mobile, and use technology as a core service delivery method. Firstly, increased autonomy through self-managed teams and worker self-service is intended to improve the optimal functioning of the team (Zhang, 2008, p. 146). This will require workers to be competent in the use of workforce-management technologies, such as scheduling, rostering and human resource management systems. Secondly, increased mobility from mobile technologies, telehealth, and remote monitoring technologies is intended to extend worker mobility to work remotely across the whole workforce (not just community care). Finally, this shift will require workers to be competent in data extraction and analysis as well as in electronic communication delivery of their services. These new expectations are likely to result in a 'skills tension' where existing worker skills and competencies may not meet the needs of the future technology-enabled work environment.

This 'skills tension' will require workers to have both strong interpersonal skills to develop relationships and provide person-centred care, and the skills of technology use or 'digital literacy' (Barnett et al., 2020; Thomas et al., 2020). The tension between these skills was recognised by Højlund and Villadsen (2020), who cautioned that technology-guided care provision may drive workers' attention towards "care planning and monitoring rather than of engaging with care recipients interactionally" (p. 191). The new work environment will require the delicate development of skills to use technology whilst emphasising the importance of providing human-centered care. This places pressure on aged care providers, government, and training providers to develop digital/technology competencies for the unique environment of aged care service delivery as they begin to mature in the use of technology.

Implications for Key Stakeholders

Implications for Government Policy and Funding

The findings of this study provide insight into how the aged care environment in Australia is being reshaped (Fleming et al., 2018), and provides new information to inform the development of policy that assists the sector towards a sustainable outcome (Kaaronen, 2017). The key effects of technology in aged care, discussed in the previous section, have several implications for government funders, regulators, and policymakers in aged care. These implications include the need to acknowledge the limited technical agility within providers to quickly adapt to assurance processes; for education and training providers to support new skills needed in the aged care work environment; and the need to address sector-wide workforce attraction strategies.

Aged care providers are increasingly being required to comply with industry quality standards, compliance, and indicator reporting. Senior managers acknowledged that technology could support these assurance activities and provide more accountability for care quality. However, there was limited technical agility within providers to adapt to new assurance processes quickly due to the short-term focus on efficiency gains, and stagnant technology innovation. This finding was surprising given the imminent final report from the Royal Commission which has focussed on aged care quality and safety and signalled the use of technology to address challenges in the sector (Royal Commission into Aged Care Quality and Safety, 2020a). It is possible that senior managers view the upcoming report as likely to prompt further systemic changes that are not solved by merely focussing on technology to support compliance activities. Given this, policymakers should consider the less-than-optimal ability of providers to adapt existing, outdated technology infrastructure to support immediate changes across the sector without financial and technical support.

Secondly, as the sector matures to a more autonomous, mobile, and technology-augmented work environment, workers will require a delicate balance of technical and human-centered care skills. This 'skills tension' (described in the previous section) will require new skills in technology use for workers in aged care and necessitate education and training providers to update their training programs. This update is expected to be intensified for education providers who are already facing challenges in upskilling aged care workers with potential cultural, language, and technical literacy barriers (Adamson et al., 2017; Negin et al., 2016; StewartBrown, 2020). The 'skills tension' provides further impetus for industry pressure to invest in new workforce development strategies across Australia's aged care education and training system (Aged Care Industry Information Technology Council (ACIITC), 2018; National Centre for Vocational Education Research, 2020). With the recent launch of a National Digital Health Workforce and Education Roadmap for nurses and midwives (Australian Digital Health Agency, 2020), there is an opportunity to develop a similar digital capability framework for the aged care sector. By doing so, the sector will ensure workers are supported in the shift to a more autonomous, mobile, and technology-augmented work environment.

Finally, this study raises concerns about aged care providers' ability to support sector-wide workforce attraction strategies to overcome workforce shortages. Findings indicate that mobile technologies have disrupted communication and collaboration within the community work environment, and there is a limited appetite for providers to invest in technology to attract new workers into the sector. It is also possible that the negative perceptions of aged care work that already exist (Clarke & Ravenswood, 2019; Fanning et al., 2020; OECD, 2020; Ostaszkiewicz et al., 2016) will be exacerbated with the reported disruption in aged care during the COVID-19 pandemic

(Fowkes et al., 2020; Xiao et al., 2020). This finding is an important consideration for the *Aged Care Workforce Strategy*, which is being implemented by the *Aged Care Workforce Industry Council* (Aged Care Workforce Strategy Taskforce, 2018). For the sector-wide attraction strategies to be effective, policymakers should consider how technology is shaping the aged care work environment and adjust initiatives accordingly[3].

Implications for Aged Care Organisations

Within the provider, technology adoption was limited because senior managers felt unable to fund investment, and the lack of competition in the marketplace under-stimulated technology innovation. These factors shaped the decisions senior managers made of technology investment, despite the desire to maintain a humanistic workplace where workers were valued, and older people were central. Importantly, findings suggest that senior managers prioritised short term efficiency gains when investing in workforce-management technology. This could have negative long-term implications on organisational culture, relationship-building between workers and older people, and the quality of care provided to older people. Although gathered from a large aged care provider, findings may be extrapolated to smaller providers as the financial pressures experienced are similar across the sector according to recent research by StewartBrown (2020). To ensure person-centred care and an engaged workforce, technology adoption requires a longer-term perspective supported by appropriate investment and resources.

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[3] As a footnote to this study, given the pressures on recruiting personal care workers Department of Education Skills and Employment. (2019, 25 March 2019). *Demand for personal care workers growing* [Media]. https://www.employment.gov.au/newsroom/demand-personal-care-workers-growing, this study also provides insights for those seeking to implement technology within the disability work environment. This environment is similar to aged care due to the humanistic nature of care services required when caring for a person with a disability. Therefore, disability workforce attraction strategies could also be informed by the findings from this study.

Senior managers acknowledged that as technology increased the mobility of community care workers, opportunities for social interaction and collaboration became more limited and workers were observed disconnecting from the organisation. These findings reinforce the importance of carefully managing the impact on workers and their relationship with the organisation when introducing technology into the aged care work environment (Cavenett et al., 2018; Oppert et al., 2018; Shulzhenko & Holmgren, 2020; Wang et al., 2020; Wu, 2020). Technology adoption can result in reduced organisational connection and a culture that is not aligned with mission and values of the organisation (Eden & Burton-Jones, 2018; Fleming et al., 2018; Killett et al., 2014). Senior managers must therefore also consider the non-financial aspects, such as the humanistic dynamics of the aged care workforce, when deciding to invest in technology used in the work environment.

The 'skills tension' that is emerging within the aged care work environment will necessitate providers developing workers' skills in technology use as well as care provision. With no sector-wide training in the traditional training qualification for aged care (Aged Care Industry Information Technology Council (ACIITC), 2018; National Centre for Vocational Education Research, 2020), providers will need to invest in developing their own in-house training programs in the short term. Careful planning for this shift in skills will avoid the risk of unintentionally reducing human connection and potentially dehumanising the relationship between workers and older people (Wirtz et al., 2018). Focussing on the human-centered aspects of care delivery when developing workers' skills in technology use will ensure technology does not negatively affect the relationships between workers and older people.

Lastly, this study highlights the importance of anticipating that workers may misinterpret the intentions behind technology adoption. Brown and Korczynski

(2010), found that the introduction of scheduling technology reduced workers' discretionary "extras" because workers did not understand the objective of the technology (p. 427). A similar finding emerged within this study. Senior managers believed that community care workers interpreted the scheduling and billing technology, intended to improve safety and reduce travel time, as a signal to get their work done faster and reduce the additional time they would normally spend talking with the older person. This misconception demonstrates how technological change can shape social action (or inaction) within the aged care work environment (Hutchby, 2001), and highlights the importance of understanding knowledge and skills of workers before embarking on technological change and monitoring their response (Buntin et al., 2011; Douglas et al., 2017; Edwards & Ramirez, 2016; Erebak & Turgut, 2018; Wang et al., 2020). This has significant implications for aged care providers when adopting technology, and demonstrates the importance of defining and clearly communicating the expected outcomes of technology adoption. In this way, providers will mitigate the risk of workers misinterpreting the expectations of technology adoption and adversely affecting the quality of care provided to older people.

Implications for Technology Developers

This study supports a user-centred approach to capturing technology requirements for the aged care work environment (Gaver, 1991). By considering all eleven (11) affordances, technology providers can develop solutions to allow these unique affordances to be realised. As key investment decision makers, senior managers focussed on more efficient organising of services, replicating human tasks, and autonomy and mobility of workers for service provision. Noting the desire for more empowered workers through greater autonomy and mobility, technology should be developed to allow workers the ability to do things in their own way, as recommended

by Zhang (2008). Opportunities for new technologies to support the competence of strategic development activities were also identified to respond to the rapidly evolving marketplace and new service opportunities. The emergence of connection between workers and older people being afforded by technology highlights the opportunity for technology development to support human interaction. Crucially, of these perceived affordances only two had been realised, while the remainder were either partially realised or not yet realised in the work environment. This presents an opportunity for technology developers to respond to the user-centred requirements of technology in aged care.

Contributions to Affordance Theory

This study captures the affordances of technology within aged care from the senior manager perspective. With little research into the perspectives held by senior managers within aged care conducted to date, this study provides insights into the ways in which technology has already shaped the work environment, and how it could shape it into the future (Bharadwaj et al., 2013; Eden & Burton-Jones, 2018; Fleming et al., 2018; Killett et al., 2014; Wang et al., 2020). This insight provides the opportunity for government to consider policy to ensure aged care providers meet the expectations of society (Fleming et al., 2018), for organisations to consider how technology is shaping the humanistic work environment (Bloomfield et al., 2010; Kapadia et al., 2015), and for technology providers to develop user-centred technologies (Gaver, 1991).

Prior empirical research of organisations and technology use through affordance theory has primarily focussed on communication technologies (Evans et al., 2016). This study of affordances provides a technology-agnostic view across the whole workforce so that technology solutions are not limited to one function. This demonstrates an extension of previous affordance research which focussed on one

management function (for example social media affordances in Treem and Leonardi (2013)). Further studies that use this approach in alternative industries would provide an opportunity to extend the useability of Affordance Theory in techno-social interactions (as described by Orlikowski and Barley (2001)).

Contributing to the mid-level theory of how affordances are actualised (developed by Strong et al. (2014)), this study demonstrates how internal and external contexts can affect the realisation of affordances. For example, the expected improvement in organisational sustainability from using technology to attract and retain workers was constrained by internal financial viability issues being faced by senior managers. To address this issue, senior managers were making investment decisions which would eventually allow this affordance to be realised once financial sustainability was achieved. This demonstrates the importance of understanding the internal and external drivers of an actor's perceived affordances to understand the decisions which would affect the affordance realisation process.

This study identified, three (3) longer-term affordance outcomes from technology in aged care: gaining efficiencies of care and operations, improvements to the quality of care, and achieving organisational sustainability. Descriptions of these affordance outcomes are provided overleaf in Table 5.1.

Table 5.1

Senior manager affordance outcomes of technology in aged care

Affordance outcome	Affordance outcome description
Efficiencies of care and operations	Improvements in the ability to deliver care services to older people, and perform operational tasks in a reduced time, or at a reduced cost.
Quality of care	The provision of care services to older people at a high standard when compared to internal or external benchmarks.
Organisational sustainability	Having the leadership, talent, insights, and change strategies necessary to respond to challenges facing organisations.

Each of these outcomes can be viewed as a step towards the longer-term goal of caring for older people (Pozzi et al., 2014; Strong et al., 2014). Findings from this study indicate that none of the three outcomes were achieved with current technology, and that senior managers were prioritising technology investment to achieve efficiency gains in care and operations in the immediate future (discussed in Short-Term Focus on Efficiency Outweighs Longer-Term Focus on Quality above).

The study found senior managers identified eleven (11) perceived affordances of technology: capture of data; access to data; distribution of data; organising of services; replicating human tasks; mobility of workers; assurance over work activities; attraction and retention of workers; competence of strategic development activities; and, connection between humans. The 'connection between workers' affordance emerged because the 'mobility of workers' affordance was realised. Connection is important in community care, with workers expressing lower job satisfaction levels

due to working alone (Xiao et al., 2020, p. 8). Therefore, when greater mobility was realised through technology, workers feelings of disconnection with teammates increased. This illustrates the sensitivity of human connection and importance relationships in aged care, and demonstrates the dynamic nature and interplay of technology affordances (Fernando et al., 2016; Topo et al., 2012). The perceived affordances are described overleaf in Table 5.2.

Table 5.2

Senior manager affordances of technology in aged care

Recognition process	Perceived affordance	Perceived affordance description
Management of data	Capture of data	The potential to capture and store data electronically.
	Visibility and searchability of data	The potential to access data electronically.
	Distribution of data	The potential to seamlessly share electronic data internally within the organisation and externally with other stakeholders without human intervention.
Management of work	Organising of services	The potential for efficient, transparent, and responsive automation of scheduling services for older people.
	Replicating human tasks	The potential to replicate human tasks to allow the replacement or augmentation of a worker.
	Autonomy of work	The potential for workers and older people to access information and direct their work or services as they require.
	Mobility of workers	The potential for work to be performed without physical restrictions on the location of the worker.
Management of organisations	Assurance over work activities	The potential to ensure compliance to industry standards and manage risks through the management of processes and work activities.
	Attraction and retention of workers	The potential to enhance the attractiveness of the work environment by providing a contemporary workplace and tools which makes work simpler.
	Competence of strategic development activities	The potential to support internal customer growth and respond to external opportunities for new services and customers.
	Connection between humans	The potential to build relationships for workers and older people and provide opportunities to decrease loneliness and social isolation.

Limitations and Future Research

Recent research points to rapid technology adoption in the aged care workplace as a result of the COVID-19 pandemic experienced in Australia throughout 2020 (Barnett et al., 2020; Fowkes et al., 2020; Issa, 2020). This presents a potential limitation of this study in that senior manager expectations of technology may have evolved since data collection was completed in March 2020. From a theoretical standpoint, senior manager affordances are expected to remain the same over time (Cousins & Robey, 2015, p. 40). However, the societal shift and reference to a "Fourth Industrial Revolution" (Schwab, 2016) may be resulting in currently unidentified changes in the way humans expect technology to be used. This presents an opportunity for further research in that data has now been captured pre-COVID-19. A further comparative study would yield an understanding of any impacts on senior manager affordances of technology due to the rapid technology adoption forced by COVID-19 in a humanistic work environment.

This study confined its focus to a senior manager view of affordances and did not include workers' perspectives. Without the collection of workers' perspectives, it is not known if workers are using the technology in the way that senior managers perceived. To overcome this, a comparative study to explore the affordances of technology from the perspective of workers would provide valuable knowledge of the similarities and differences in senior manager and worker affordances. This comparison would allow potential tensions or unintended consequences to be identified before an investment in technology is made. For example, senior manager technology affordances of mobility, autonomy and connection between workers intended the work environment to be more empowering for workers. However, it is unknown if workers would view technology as supporting these feelings of task

significance and meaningfulness (Wang et al., 2020), and therefore whether this would encourage technology adoption (Kapadia et al., 2015). It is also unknown if workers would accept non-face to face communication through workplace chat and videoconferencing technologies to replace human connection (Shulzhenko & Holmgren, 2020). Uncovering these differences will extend opportunities to manage any adverse risks of implementing technology in humanistic work environments.

Studying worker affordances is also important for understanding how the workforce is responding to technology uptake and implementation. Considering the impact of the COVID-19 pandemic on technology adoption in aged care (Barnett et al., 2020; Issa, 2020), it is prudent to consider how rapid technology adoption may have further disrupted social exchanges within the care environment (Sävenstedt et al., 2006; Shulzhenko & Holmgren, 2020). This would also provide the opportunity to explore any workaround strategies workers employ to regain the human connection diminished during the pandemic (Højlund & Villadsen, 2020).

The study did not directly address the views of older people who are uniquely situated as having their home as the work environment (Cavenett et al., 2018, p. 200). These views are an important consideration, given the emphasis of providing person centred care by senior managers. Of note was senior managers' drive to improve the efficiency of aged care services through telehealth, and monitoring and sensor devices which enable care to be delivered remotely. This may be contrary to older people's preference for "high touch" care identified in prior studies (Goodwin et al., 2014; Walsh & Callan, 2011). Further research could provide insights into the evolution of technology acceptance during the global pandemic as well as the impacts on social isolation and participation (Baker et al., 2018), and potential dehumanisation of relationships (Wirtz et al., 2018).

Conducting further research into worker and older people's affordances would also provide the opportunity to apply additional theoretical perspectives. Such research could provide new knowledge about the interpersonal processes within an organisation that relate to decision-making for senior manager technology adoption. It could also provide further insight into the processes surrounding senior manager adoption of technology within the aged care work environment.

Conclusion

This study addressed calls for further insights into how technology is shaping the aged care work environment. From the perspective of senior managers working in the sector, findings were analysed through the lens of Gibson's affordance theory (2014). Analysis revealed eleven (11) senior manager affordances of technology with results showing that the shift towards community care provision, financial pressures, workforce shortages, and inter-generational differences resulted in investment being focussed on realising affordances to improve the efficiency of care and operations. This motivation for technology adoption, however, outweighed the desire to improve the quality of care or achieve organisational sustainability. Significant ways in which technology adoption is shaping the work environment were revealed including the disruption to social exchange methods within the community care environment; the limited speed of adoption that inhibited innovation; the short-term focus on efficiency outweighing a longer-term focus on quality of care; the drive for work efficiencies over-shadowing the intention to attract new workers; and the 'skills tension' being created in the humanistic context of aged care. Through the lens of Affordance Theory (Gibson, 2014), this research demonstrated the sensitivity of the aged care work environment to technology adoption. Implications for government, aged care organisations, and technology providers all point to the need to continue to address technology adoption in this expanding, resource-constrained and important sector.

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Appendices

Appendix A

Redacted Survey Instrument – Provider Senior Managers

Information and Communication Technology in Aged Care: how is it shaping the workplace environment?

A. Participant name: **Aged Care Provider**   Participant role: **Senior Leader**

B. Preliminary introductions
- ☐ explanation of project scope
  - This study explores the dynamics of information and communication technology (technology) in the aged care workplace and **how senior managers perceive that technology is shaping the aged care work environment.**
- ☐ gaining of written consent
  - Information is confidential, i.e. looking for patterns in what people say and your comments won't be attributed to you or your organisation
- ☐ begin audio-recording
  - Will be transcribed and stored in a secure location that only my Supervisors and I have access to

C. I would like to begin by asking you some general questions about you and your work so that I can tailor my later questions:

Demographics	Response		
Please indicate your gender?	Male ☐	Female ☐	Prefer not to say ☐
Please indicate your year of birth?			
Please indicate the number of years you have worked in aged care?			
Please indicate the number of years you have worked in your current role (confirm title)?			
Please describe your role and your responsibilities			

D. I would now like to begin by asking you some more specific questions about the use of technology in the aged care workplace:

Questions about EXISTING technology at Aged Care Provider

1) ****What technologies have been recently (within the last 3 years) implemented within the AGED CARE PROVIDER aged care workplace(⁴)? I'll come back to each piece of technology to ask a series of questions below.*

2) ***Prior to the implementation of this technology, what did you hope it would achieve?*

3) *Has this technology met your expectations?*

4) *How has the introduction of this technology impacted the nature of care for older people?*

5) ***How has the introduction of this technology shaped the workplace for workers?*

6) ****How has the introduction of this technology into the workplace impacted the carer-older person relationship?*

7) ****Has there been any observable differences in impacts on the residential and community aged care workplaces?*

***Questions about NEW technology being considered within Aged Care Provider

8) ****How are advances in technology more broadly in society influencing the adoption of technology at Aged Care Provider?*

9) *Thinking about the next 5 to 10 years for the aged care workplace at Aged Care Provider:*
   a) ****What are some of the new technologies that are currently being considered for use within the aged care workplace?*

   b) ****What are the drivers for why you are considering investing in this new technology? For example, strategic positioning, marketing/branding, staff productivity, financial sustainability, policy or process changes, functional changes for workers.*

10) *Are there different technologies being considered within the residential and community aged care workplaces? What are the differences?*

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⁴ This includes all technology used by front-line care workers.

Questions about other people's considerations about technology

We've talked about your perspective of technology in the aged workplace, now I'd like to ask a series of questions about other stakeholders and your thoughts on their adoption of technology.

11) **Are the views of other stakeholders considered when you think about adopting new technology in aged care?

    a) *If so, who are the stakeholders? I'll come back to each stakeholder to ask two further questions. For example, older person, families, workers, supervisors, regulators*

    b) *How do you gather the stakeholders' views of technology to be adopted in aged care?*

    c) ***What are their main drivers for this stakeholder/s in adopting technology in the workplace?*

12) **If stakeholder input is not sought from supervisors, frontline care workers and older people, from what you have observed:

    a) *What are the main drivers for front-line care workers when they are adopting technology in the workplace?*

    b) *What are the main drivers for the supervisors of front-line care workers when they are adopting technology in the workplace?*

    c) *What are the main drivers for the older people when they are adopting technology in their care environment?*

Role specific questions:

13) *Aged care, HR, Strategy: Thinking about the past, to what extent has job design been considered when new technology is implemented?*

    a) *How have jobs changed over the past three years?*

14) ****Aged care, HR, Strategy: How are aged care jobs at Aged Care Provider expected to change in the next 5 to 10 years?*

    a) *What is the biggest impact on this change? (i.e. technology or not technology)*

15) ****HR and Strategy: Has technology created cultural alignment or misalignment in the workplace?*

    a) *What can you see that demonstrates this alignment or misalignment this?*

16) *IT: To what extent is the concept of the 4th Industrial Revolution (a time of greater impact, scope, and velocity of change due to technology) or digital disruption discussed amongst the IT team, and the broader organisation?*

      a) What are the risks or strengths of the 4IR/digital disruption that have been considered for aged care at Aged Care Provider?

In conclusion:

Please indicate your level of expertise with technology in your work environment?	A - Advanced
	I - Intermediate
	N - Novice
	B - Basic Awareness

Do you have any questions? Or wish to add anything?

Is there any further documentation you could provide which would help me to understand how technology is shaping the aged care workplace at Aged Care Provider?

Thank you. Your responses will remain confidential, a report will be provided to Aged Care Provider in the latter part of the year which summarises my findings.

Appendix B

Redacted Survey Instrument – Industry Senior Managers

Information and Communication Technology in Aged Care: how is it shaping the workplace environment?

A. Participant name: **Industry Professional**   Participant role: **Senior Leader**

B. Preliminary introductions

☐ explanation of project scope

- This study explores the dynamics of information and communication technology (technology) in the aged care workplace and **how senior managers perceive that technology is shaping the aged care work environment.**

☐ gaining of written consent

- Information is confidential, i.e. looking for patterns in what people say and your comments won't be attributed to you or your industry body

☐ begin audio-recording

- Will be transcribed and stored in a secure location that only my Supervisors and I have access to

C. I would like to begin by asking you some general questions about you and your work so that I can tailor my later questions:

Demographics	Response		
Please indicate your gender?	Male ☐	Female ☐	Prefer not to say ☐
Please indicate your year of birth?			
Please indicate the number of years you have worked in aged care?			
Please indicate the number of years you have worked in your current role (confirm title)?			
Please describe your role and your responsibilities			

D. I would now like to begin by asking you some more specific questions about the use of technology in the aged care workplace:

Questions about EXISTING technology

1) **Prior to the development of technology used by aged care workers, what did you hope it would achieve?*

2) *Has the technology that you see being developed by technology providers and aged care providers met your expectations?*

3) *How has the introduction of technology used by aged care workers impacted the nature of care for older people?*

4) *How has the introduction of technology used by aged care workers shaped the workplace for workers?*

5) ****How has the introduction of technology used by aged care workers into the workplace impacted the carer-older person relationship?*

6) ****Has there been any observable differences in impacts on the residential and community aged care workplaces?*

***Questions about NEW technology being designed for aged care workers*

7) *Thinking about the next 5 to 10 years for technology used by aged care workers:*
   a) ****What are some of the new developments that are currently being considered for use within the aged care workplace?*

   b) ****What are the drivers for why you see organisations investing in this new technology? For example, strategic positioning, marketing/branding for the organisation, staff productivity, financial sustainability, policy or process changes, functional changes for workers.*

8) *Are there different technologies being considered within the residential and community aged care workplaces? What are the differences?*

9) *The concept of the 4th Industrial Revolution is a time of greater impact, scope, and velocity of change due to technology, what do you see as* the risks or strengths of the 4IR/digital disruption that we need to consider?

Questions about other people's considerations about technology

We've talked about your perspective of technology in the aged workplace, now I'd like to ask a series of questions about other stakeholders and your thoughts on their adoption of technology.

10) ***Are the views of other stakeholders gathered when you are developing strategies about adopting new technology in aged care?*

    a) *If so, who are the stakeholders? I'll come back to each stakeholder to ask two further questions. For example, older person, families, workers, supervisors, regulators*

    b) *How do you gather the stakeholders' views of technology to be adopted in aged care?*

    c) ****What are their main drivers for this stakeholder/s in adopting technology in the workplace?*

Role specific questions:

11) ****From your perspective how do you see aged care jobs are expected to change in the next 5 to 10 years?*

    a) *What is the biggest impact on this change? (i.e. technology or not technology)*

12) ****From your perspective, has technology created cultural alignment or misalignment in the workplace?*

    a) *What can you see that demonstrates this alignment or misalignment this?*

In conclusion:

Please indicate your level of expertise with technology in your work environment?	A - Advanced
	I - Intermediate
	N - Novice
	B - Basic Awareness

Do you have any questions? Or wish to add anything?

Is there any further documentation you could provide which would help me to understand how technology is shaping the aged care workplace?

Thank you. Your responses will remain confidential.

Redacted Survey Instrument – Technology Senior Managers

Information and Communication Technology in Aged Care: how is it shaping the workplace environment?

A. Participant name: **Technology Developer**   Participant role: **Senior Leader**

B. Preliminary introductions

☐ explanation of project scope
- This study explores the dynamics of information and communication technology (technology) in the aged care workplace and **how senior managers perceive that technology is shaping the aged care work environment.**

☐ gaining of written consent
- Information is confidential, i.e. looking for patterns in what people say and your comments won't be attributed to you or your organisation

☐ begin audio-recording
- Will be transcribed and stored in a secure location that only my Supervisors and I have access to

C. I would like to begin by asking you some general questions about you and your work so that I can tailor my later questions:

Demographics	Response		
Please indicate your gender?	Male ☐	Female ☐	Prefer not to say ☐
Please indicate your year of birth?			
Please indicate the number of years you have worked in aged care?			
Please indicate the number of years you have worked in your current role (confirm title)?			
Please describe your role and your responsibilities			

D. **I would now like to begin by asking you some more specific questions about the use of technology in the aged care workplace:**

Questions about EXISTING technology

1) ***Prior to the development of TechDeveloper technology, what did you hope it would achieve?*

2) *Has the technology you've built met your expectations?*

3) *How has the introduction of TechDeveloper technology impacted the nature of care for older people?*

4) *How has the introduction of TechDeveloper technology shaped the workplace for workers?*

5) ****How has the introduction of TechDeveloper technology into the workplace impacted the carer-older person relationship?*

6) ****Has there been any observable differences in impacts on the residential and community aged care workplaces?*

***Questions about NEW technology being designed by TechDeveloper

7) *Thinking about the next 5 to 10 years for TechDeveloper:*
   a) ****What are some of the new developments that are currently being considered for use within the aged care workplace?*

   b) ****What are the drivers for why you are considering investing in this new technology? For example, strategic positioning, marketing/branding for your product, staff productivity, financial sustainability, policy or process changes, functional changes for workers.*

8) *Are there different technologies being considered within the residential and community aged care workplaces? What are the differences?*

9) *The concept of the 4th Industrial Revolution is a time of greater impact, scope, and velocity of change due to technology, what do you see as the risks or strengths of the 4IR/digital disruption that we need to consider?*

We've talked about your perspective of technology in the aged workplace, now I'd like to ask a series of questions about other stakeholders and your thoughts on their adoption of technology.

10) **Are the views of other stakeholders considered when you think about adopting new technology in aged care?*

      a) *If so, who are the stakeholders? I'll come back to each stakeholder to ask two further questions. For example, older person, families, workers, supervisors, regulators*

      b) *How do you gather the stakeholders' views of technology to be adopted in aged care?*

      c) ****What are their main drivers for this stakeholder/s in adopting technology in the workplace?*

Role specific questions:

11) ****From your perspective how do you see aged care jobs are expected to change in the next 5 to 10 years?*

      a) *What is the biggest impact on this change? (i.e. technology or not technology)*

12) ****From your perspective, has technology created cultural alignment or misalignment in the workplace?*

      a) *What can you see that demonstrates this alignment or misalignment this?*

In conclusion:

Please indicate your level of expertise with technology in your work environment?	A - Advanced
	I - Intermediate
	N - Novice
	B - Basic Awareness

Do you have any questions? Or wish to add anything?

Is there any further documentation you could provide which would help me to understand how technology is shaping the aged care workplace?

Thank you. Your responses will remain confidential.

Appendix D

Interviews During COVID-19 Reflection

This appendix captures a reflection on the necessity to adopt video-conference methods for interviews because of the COVID-19 pandemic.

Due to the emerging COVID-19 pandemic in 2020 social distancing restrictions, two (2) interviews were conducted online via the Zoom video conferencing platform as an alternative to meeting in person. At the time of these interviews (24th and 25th March 2020), the use of video conferencing platforms to host meetings was starting to have a rapid uptake because of social distancing restrictions coming into force. Without the option of using video conferencing, it was highly likely that both interviews would have been cancelled by participants for no other reason bar social distancing rules. As the Zoom video conferencing platform was made freely available by the Queensland University of Technology (QUT) to students, the logistics of arranging interviews and the ability for external participants to access the platform was made very easy.

Seitz (2016, p. 232), highlighted the importance of the scope of research in whether video conferencing is appropriate given the lack of intimacy in the medium. My questions were focussed on the workplace and not of personal nature that would require a more intimate environment. The unanticipated use of video conferencing was also appropriate given my focus on the use of technology in the workplace. The Zoom video conference provided an illustration of how technology could support human interaction in a remote environment. My sample was also made up of Executives and Directors, all of whom were likely to have a great deal of experience in building rapport and communicating electronically instead of face to face.

As I had experienced numerous video conferences previously in a work setting, I felt comfortable preparing for and using Zoom. However, using video conferencing in my home meant I needed to be aware of my background and the image conveyed to participants. As argued by Lo Iacono et al. (2016, pp. 8, 10), I felt my background conveyed a meaning about me and my research; and I wanted to be assured of my privacy by not revealing too much of my personal space. To manage this, I re-arranged books on my bookshelf, removed some appliques from the wall and manoeuvred the camera so that the angle of the light meant I could be seen clearly.

I held a pre-existing professional relationship with one of these participants, but not with the second. In both interviews, I found it easy to build rapport and engage participants in the research. At the start of my interview with the participant known to me, it was evident that they were not familiar with the Zoom platform. However, I noticed that this passed within the first minute or so of starting our meeting. During the interview with the participant unknown to me, the interruptions and technical difficulties experienced partway through the interview and the subsequent sharing of personal information appeared to develop the relationship further and allow the participant to feel more comfortable with the research questions. This phenomenon has been observed by other researchers, for example, Archibald et al. (2019, p. 5) who found technical difficulties often resulted in the unintended benefit of joint problem-solving establishing rapport between participants and interviewers. Therefore, I experienced very little difference in building rapport during interviews face to face compared to using Zoom. I would concur with the arguments posited by Deakin and Wakefield (2014), that 'online interviews can produce data as reliable and in-depth as produced during face-to-face encounters'.

The only challenge experienced by using this medium, which is referenced in the paragraph above, was the technical issues experienced in one of the interviews. Insufficient bandwidth meant that the connection dropped out for a short time, and the quality of the audio recording was not as good as that recorded on my audio recording device but was still of sufficient quality for transcription. Technical challenges have been the experienced by many other researchers using video conferencing, leading Mirick and Wladkowski (2019, p. 3068) to highlight the importance of being trained in how to handle technology glitches and have a contingency plan in place. I would concur and add that having a second device recording the audio of the interview is highly recommended.

This reflection confirms that the interview data gathered using video-conference methods was as valid as the data gathered face to face.

Appendix E

Future technologies considered by senior managers

Technologies mentioned briefly by participants are included in the Table E.1 below.

Table E.1

Future technology mentioned by senior managers

Future technologies being considered	Brief commentary based on participant references
Client portal	An app which links through to the client management system that allows older people to view and change bookings, put in service requests and receive updates on the scheduling of services.
Family portal	Communication technology which allows workers to send updates to families on the care being received by older people. This includes sending photos and establishing video conferences to allow people to communicate directly with each other.
Online portal	Communication technology to allow older people to interact with workers in the provision of services through video and audio conferences.
Monitoring and sensor devices	Wearable devices and monitoring points to capture health data about older people or prompt a worker to action.
Video conferencing for telehealth	Technologies which transmit live voice and video data between two or more participants at different sites through computers and networks to enable the provision of care services to be performed virtually.
Robotics	Machines able to replicate certain tasks such as the physical effort of delivering meals and linen to care areas, and care delivery such as establishing a connection between workers and older people to commence therapy.
Drug administration	Automated dispensing system to store, package, label, dispense and distribute drugs to older people.
Network connectivity through Wi-Fi	The wireless network connection used between mobile computing devices over short distances.
Scheduling and rostering	Automated matching of workers with older people whilst maximising efficiency of scheduling services, and worker rosters.
Artificial intelligence	Technologies that perform tasks normally requiring human intelligence, for example visual perception, speech recognition, and decision-making.
Cloud computing	Using a network of remote servers hosted through the internet to store, manage and process data rather than maintaining local physical infrastructure.

Future technologies being considered	Brief commentary based on participant references
Continence technology	A form of monitoring device, with analytics to anticipate when older people are likely to have a bowel or bladder movement so that workers can anticipate the care required.
Drones	Unmanned aerial vehicles which could transport medication to older people in remote locations.
Human resource management system	Software to manage human related business processes and data, including the ability for workers to self-service through access to data and completion of processes, and for leaders to monitor worker capability and performance.
Virtual reality	Technologies which simulate an experience by generating a three-dimensional image or environment that allows audio interaction by an older person.