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UNDERSTANDING DIGITAL INEQUALITY

AN ANALYSIS OF UNEQUAL CONNECTIVITY IN CARLTON HOUSING ESTATE, MELBOURNE, VICTORIA

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In partnership with

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AN ANALYSIS OF UNEQUAL CONNECTIVITY IN CARLTON HOUSING ESTATE, MELBOURNE, VICTORIA

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Tom Carment, Carlton Flats, 2016, oil on linen 24x19.5cm

IMAGES:
Page 11 Pexels
Page 12 Pexels
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Page 22 Pexels
Page 33 Pexels
Page 35 Pexels
Page 36 Pexels
Page 37 Pexels
Page 43 Pexels

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CONTENTS

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

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Australia has some of the best internet coverage globally, and yet in 2018 approximately 2.5 million Australians had no internet connection. This reveals significant limitations in access, digital ability, and affordability, despite major infrastructure investments (ACCAN, 2021).

While recent research suggests that these numbers have dropped due to the online demands that arose during the COVID-19 pandemic (ACMA, 2021), access, affordability, and adequacy of connection for some citizens remain out of reach due to a range of barriers. To ensure that everyone has equal opportunity to use digital technologies, and thus to ensure access to social and economic opportunities and essential government services, targeted investments to reduce digital inequality are necessary.

Digital inclusion in Australia is influenced by a person's income, age, education level, and residential location. This report demonstrates that digital inequality is not measured by access to internet alone, but also by quality of service and internet providers' accountability in the face of poor customer experience. Focus on the National Broadband Network (NBN) in Australia has led policymakers to overlook the many people who access the internet predominantly with their smartphones or who rely on their smartphones to augment poor home internet connections. The roll out of the NBN has led many to assume that high quality internet has been brought into everyone's reach. This assumption means that the consequences of poor connectivity risk becoming less visible, and exacerbates concerns for the people who continue to experience digital exclusion.

Working with principles of co-design with community partners and Carlton public housing residents, we conducted a case study of how people manage digital inequality. Our data analysis revealed that people were not as digitally connected during the pandemic and ensuing lockdowns as the services upon which they depended assumed they were. Online home-schooling demanded a 1:1 device to person ratio and many low-income families needed to buy or request assistance to meet this demand. Additional constraints were felt in access to employment, and in essential services such as health and income support (Centrelink).

Collectively, the survey, focus group, and interview results indicated that access to reliable and sufficiently fast internet is not a mere matter of affordability, but also of inconsistent accessibility, as public housing residents are offered a substandard service. Participants found internet providers' customer service inaccessible and unresponsive from the time of internet installation through to troubleshooting problems. Many reported paying more than planned for maintaining digital connection because of substandard service. This reportedly had flow on effects for participants' access to education and employment, exacerbating existing inequalities. The many different components that must work together to produce a reliable internet connection (a data plan with a particular provider, a phone or other device, a modem) obfuscated the diagnostic process and made it impossible for participants to identify which component was making their internet lag. As a result, their access to information and other necessities was jeopardised.

RECOMMENDATIONS

Everyone should be able to get low cost, good internet and that is why we recommend that priority must be given to the development of not-for-profit alternatives that can be rolled out in places such as public housing estates where many people stand to benefit from more cost-effective options.

Internet companies and governments need to set minimum quality standards to ensure that the internet works for everyone. Internet companies and governments work together to create a product offering that provides low-cost options that do not force people to sacrifice quality or reliability.

Internet/NBN costs need to reflect that many people use mobile data when the NBN fails.

Governments, internet companies and social housing providers should speak to people who find it hard to access the internet because the involvement of housing providers can help make sure that the internet works better inside social housing estates.

Researchers must focus more on how people access the internet, not just on whether they access the internet or not and at what cost.

INTRODUCTION

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In the time that has passed since the World Health Organization (WHO) declared it a pandemic, the novel coronavirus (COVID-19) outbreak has presented unprecedented challenges in many aspects of people's lives. The implementation of strict social distancing measures has accentuated a strong reliance on the internet, intensifying the importance of online connectivity to ensure access to an array of services from online classes and work-from-home videoconferencing calls to JobSeeker payments and up-to-date government COVID-19 information.

However, while most of Australia's population has maintained basic connectivity during the pandemic, some groups have faced significant barriers in their access to and use of the internet. Older adults, migrants with low proficiency in English, and people from lower socio-economic backgrounds are at a higher-than-average risk of digital exclusion and faced unique struggles during the COVID-19 pandemic.

Although Australia has some of the best internet coverage in the world, approximately 2.5 million Australians are not connected. This reveals significant limitations in access, digital ability, and affordability, despite major infrastructure investments (ACCAN, 2021). To ensure that everyone has equal opportunity to use digital technologies, and to ensure access to social and economic opportunities and essential government services, targeted investments to reduce digital inequality are necessary.

In alignment with the Australian Digital Inclusion Index (Thomas et al., 2021), we define digital inclusion as: *ensuring all Australians can access and use digital technologies effectively*. We strongly support the assertions of the United Nations (Economist Intelligence Unit, 2018) and the Australian Human Rights Commission (AHRC, 2016) that we now need to consider access to the internet as a human right. In accordance with the *Report of the Special Rapporteur on the promotion and protection of the right of freedom of opinion and expression* (HRC 2011), we identify access to the internet as an 'enabler' of a variety of human rights: economic, social, and cultural rights, the right to participate in cultural life and to enjoy the affordance of science and technological advances, for example. During the pandemic, people shifted to online tools to manage their health, education, and work, and to participate in cultural and faith-based activities and local events, and connect with, participate in and understand the world and local events. Social media and other communication platforms offered the possibility of maintaining connections with family, friends, and the wider world in a time of global crisis.

Digital inclusion in Australia is influenced by a person's income, age, education level, and residential location. As will be demonstrated in this report, digital inequality is not measured by access to internet alone, but also by quality of service and internet providers' accountability in the face of poor customer experience. A policy and media focus on the National Broadband Network (NBN) in Australia has led policymakers to overlook the many people who predominantly access the internet with their smartphones. Census data is not fine-grained enough to capture experiences of digital exclusion in otherwise well-connected neighbourhoods. Further, the roll out of the NBN has created an assumption that internet has been brought into everyone's reach. As a result, the consequences of poor connectivity risk becoming less visible, and this lack of visibility may in turn deepen inequalities in society.

To identify factors contributing to digital inequality, we worked with community partners to co-design methods and tools to understand Carlton Housing Estate residents' lived experiences of digital access, affordability, and ability.

We worked with community partners and residents in Carlton public housing to build a case study of how people manage digital inequality. The Carlton Housing Estate has approximately 3,500 residents. This is a very disadvantaged resident population with 30% living on an income less than $300/week (ABS, 2016) and a pre-COVID-19 unemployment rate of 48%. Additionally, the Carlton public housing residents are a very culturally diverse population. Nearly two-thirds (63%) of Carlton's residents were born overseas and 57% speak a language other than English at home (ABS, 2016).

According to NBN 2020 figures, 32% of households at Carlton Housing Estate are not connected to the network. Gaps in access were always a social problem, but COVID-19 has made them catastrophic due to epidemiological interventions such as social distancing, self-isolation, and closure of non-essential services. In response to these observations, The University of Melbourne partnered with community organizations to donate used hardware to Carlton Housing Estate households. The research project leveraged the relationships built in that university-community partnership to understand the scope of the problem of digital inequality as well as the fine-grained experiences and strategies adopted by people who are subject to this form of inequality.

LITERATURE REVIEW (SCOPING REVIEW)

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CONCEPTUAL APPROACHES TO DIGITAL INEQUALITIES

From the mid-1990s, digital inequality has been a concern for researchers and policymakers aware of the disadvantage experienced by those with limited or no access to technologies such as home computers and the internet. Over the years, computers and internet connections became more affordable, but disparities in access persisted. A focus on the divide between those who had access to and consistent use of the internet and those who did not have such access—later conceptualised as the 'first-level digital divide'—came to be seen as inadequate for explaining the complexities of digital inequality. As a result, alternative explanations for digital inequalities emerged. Contemporary scholarly work on the digital divide not only examines access to technological infrastructure and high-speed internet, but the barriers to gaining the necessary skills and knowledge to effectively engage in an increasingly digitised world (Alam & Imran, 2015; Townsend et al., 2015). This more multifaceted model of digital inequality has been conceptualised through a second-level digital divide concerned with internet usage disparity (Büchi et al., 2016). An additional third level explores the benefits generated from internet usage (van Deursen & Helsper, 2015).

Despite the second-level and third-level attention to understanding the implications of a wider range of barriers to digital access, affordability remains a strong focus in research. The first-level digital divide—focusing on the disparity between those who can afford technology and access and those who cannot—continues to shape analysis of the causes of exclusion, such as income and location. In Australia, the costs and quality of connection vary significantly for remote, regional, and metropolitan locations. The first-level digital divide can produce a simplistic, binary understanding of digital inequality as occurring between the 'haves and have-nots' of digital technology (Erdiaw-Kwaise & Alam, 2016; Halford & Savage, 2010), when the reality is much more complex. It is as a result of this blunt conceptualisation that mobile-only users, a group of internet users who have access but are structurally excluded from some of the opportunities and conveniences that the internet exclusively offers to desktop and laptop users, have been slow to appear on researchers' radars.

Second-level digital divide considers the digital and technical skills that people need to make effective use of the devices and connections to which they have access. The concept responds to research that has indicated that some forms of digital inequality find their roots in disparities in different users' skills in navigating the internet safely and effectively, and in troubleshooting the errors they encounter. Scholarly research and public policy have highlighted that elderly people (Neves et al., 2013; Martins Van Jaarsveld, 2020), people who have limited proficiency in English (Alam & Imran, 2015; Lloyd et al., 2013; Nguyen et al., 2017), and people who have low incomes (Goedhart et al., 2019; Powell et al., 2010) find it more challenging to acquire or maintain these skills in the face of ever advancing technologies. Research also highlights that people who are positioned at the intersections of more than one of these demographic characteristics experience compounding exclusionary effects.

Intersectional disadvantage related to access and usage of the internet is a key concern for public housing residents who have low incomes, often speak languages other than English at home, and are statistically more likely than average to have disabilities. For example, previous research in a Melbourne housing estate indicated that some tenants with a background of migration experienced financial *and* language barriers to accessing the internet (Broadbent et al., 2013). For those who have non-English speaking backgrounds, the challenges of understanding information that is produced exclusively in the unfamiliar language of English exacerbates the already significant barrier of cost when it comes to internet connections (Alam & Imran, 2015; Safarov, 2021). During the COVID-19 pandemic in Australia, the unique challenges faced by migrants who live in public housing gained additional visibility. In particular, the dissemination of information regarding rapidly changing local exposure sites and lockdown measures to culturally and linguistically diverse communities posed serious difficulties for state and local governments in Victoria (Houghton, 2020; Krajl et al., 2020). The ensuing crisis made it evident that the continuing digitisation of services necessitates a realignment of service delivery and information dissemination in the face of increasing social exclusion of non-English speaking migrants in English-speaking countries.

Research on the third-level of the digital divide conceptualises and investigates digital inequality on the basis of who is able to reap the benefits of their internet access and digital skill. Because the benefits of internet usage appear greater for some groups such as students, younger adults, and those in higher income brackets (Büchi et al., 2016), the socio-economic inequalities that underpin digital inequality frequently go on to widen disparities in economic, social, and health outcomes (van Deursen & Helper, 2015). That is, certain social groups—students, younger adults, and those in higher income brackets—are able to make better use of the internet both on- and offline. Technological literacy can help to overcome local infrastructural barriers to accessing reliable internet (Freeman et al., 2020) as will be discussed further below, but third-level digital divide research remains significant in its highlighting of the potential inequalities of internet use. The conceptual framework of the three levels of digital divide reflects not only differences in physical access to technology, but also the wider socio-economic inequalities that underpin and reproduce this form of inequality (Barzilai-Nahon, 2006; Underwood, 2007).

DIGITAL EXCLUSION IN THE CONTEXT OF ONGOING DIGITISATION

The use of digital technology is no longer optional; it was already largely prerequisite for access to many essential services before the pandemic (see, for example, Schou & Pors, 2019; Sourbati, 2012; Watling and Crawford, 2010). Payment systems, employment opportunities, and welfare benefits were primarily advertised online, and digital service delivery was fast becoming the default mode of access to services (Schou & Pors, 2019). Those who were relatively disconnected from —or inconsistently connected to— the internet prior to 2020 risked becoming disconnected from opportunities and resources and experienced increasing barriers to social participation, with deep-cutting consequences. Experiences of digital exclusion emerge from a range of factors from the lack of access to hardware and network resources, to educational, cultural, and social barriers (Giansanti & Veltro, 2021).

The pandemic years have thrust this digital divide further into public consciousness, with social distancing measures and lockdowns transforming the way Australians engage with the internet. E-commerce has become the norm for domestic retail and services, including food delivery and entertainment (Hinton, 2021). Both personal and professional communication and socialisation have become increasingly digitised, with 77% of Australian adults using online communication apps in the first half of 2020 (ACMA, 2020) and just under a third (32%) of Australians working from home between April-May 2020 (Roy Morgan, 2020). Digital activity has moved from a consumer choice to a fundamental medium of community, service, and market engagement.

Not everyone has been able to engage fully in this increasingly digitised society though. Thomas et al. (2020) highlight the disruptive impact of COVID-19 for students in low-income households, as well as the social isolation and loneliness of older Australians with low digital access and literacy. Their study demonstrated that the demographics with the lowest digital inclusion in Australia were households earning less than $35k/year and those aged 65 and over (Thomas et al., 2020, p. 6). With the growing emphasis on digitisation, these groups—those with low socioeconomic status and those aged 65 and over—face increasing exclusion and inequality.

PEOPLE AT RISK OF DIGITAL EXCLUSION

While policy measures such as Australia's NBN roll-out can in theory assist in enabling greater Internet access for people on low incomes, the European research literature indicates that the adoption of digital solutions for services is still significantly influenced by education levels (Elena-Bucea et al., 2020). Digital literacy is an increasingly vital element in the future landscape of work; while it promises upward mobility, it also simultaneously widens the digital divide for excluded demographic groups (Chetty et al., 2018; United Nations, 2014). These developments are gendered; low-income mothers, who largely shoulder the responsibility of regulating internet use for children, often require greater digital literacy skills but lack the time and opportunity to devote to their enhancement (Goedhart et al., 2019). The need for parents to manage virtual, home-based learning during the COVID-19 pandemic demonstrated how digital literacy (or lack thereof) could impact on both parents'—although primarily mothers'—employment (Collins et al., 2021) and children's educational outcomes (Black et al., 2021).

When schools were closed during the pandemic, concerns were raised about potential negative repercussions for children from disadvantaged backgrounds such as those in low-income families and living with disability (Brown et al., 2020; Drane et al., 2021; Smith et al., 2022). The OECD's (2020) report into remote learning experiences identified a significant gap in communication between teachers and parents/carers across the globe and advised that effective communication between school and home was the 'critical element' (p. 8) in remote learning. The 2021 ADII (Thomas et al., 2021) indicates that families with school-aged children and the lowest incomes (those below $35k/year) generally lacked access to appropriate devices, paid more for their digital services than others, and had fewer digital skills to draw on. In important findings, these families were also identified as likely to purchase more data, considered essential for school, work, and leisure tasks (Ogle & Musolino, 2016), while paying a higher price for that data than the average Australian family (Thomas et al., 2021). These families appeared to be reliant on a higher amount of mobile data (Ogle & Musolino, 2016), perhaps in part because they were more likely to rent than own their homes, and thus were unlikely to have control of or interest in committing to a land-based service contract with the associated installation costs.

As one of the strongest predictors of technology adoption, the age-related digital divide has been the subject of considerable discourse and policy focus within developed societies (NSPAC, 2011; Neves et al., 2013). Social isolation has a demonstratively greater effect on older adults and the resulting loneliness is linked with depression (Coyle & Dugan, 2012), which, as Blazer et al. (2001) demonstrated, is associated with higher mortality rates for older adults. With the onset of lockdown measures and social distancing during the COVID-19 pandemic, the necessity to engage digital social technologies further entrenched the age-based digital divide and its negative impacts (Van Jaarsveld, 2020). Of course, these issues are further exacerbated within the intersectional communities of older migrants (Good Things Foundation Australia, 2021; Safarov, 2021) and older adults with lower levels of education (Good Things Foundation Australia, 2021; Neves et al., 2013). With an ageing population in Australia and many other developed economies, particularly with reduced population growth due to COVID-19 (Centre for Population, 2020), the digital divide represents another facet of social exclusion for older adults (Neves et al., 2013).

Digitisation has been co-opted by neoliberal governance processes that aim to activate citizens into self-provision, allowing governments to cut costs by placing responsibility for welfare administration with citizens (Ellcessor, 2016; Schou & Pors, 2019). Consequently, the inability to use technology is often positioned as a moral deficit or failure on the part of the individual; it therefore generates feelings of being second-class amongst those who need to use alternative avenues from the default digital (Schou & Pors, 2019). Technology thus interacts with ideas and discourses of normalcy that work to oppress and exclude people who do not speak English, who are not in paid employment, and/ or who live with disability, because they are often less able to use digital tools and resources.

The distribution of infrastructure and the qualitative dimensions of access to infrastructure have profound effects on the ability of an individual to leverage digital technology to their advantage in their everyday lives. Hassani (2006), for instance, revealed the importance of having multiple locations from which to access the internet for the quality of internet use. People who can only access the internet in public places like libraries are less likely to look up medical information, seek medical services, or engage in other private matters online (Hassini, 2006). In a country like Australia, the privatisation of telecommunications infrastructure has enabled a class-based variance in internet access, with the most reliable, geographically even, and fast connections available to those who can afford to pay premium. It thus becomes evident how a splintered urbanism in the form of a privatised internet network has fine-grained implications for the user experience when people try to access opportunities via the internet. This context makes it increasingly important that access to the internet is viewed as a right rather than a commercial product.

RIGHTS, CONSUMER PROTECTIONS, AND REGULATION

As early as 2011, the Human Rights Commission of the United Nations promoted internet access as a human right (Economist Intelligence Unit, 2018, p. 2). Deficiencies in network and technical infrastructure, income, and education are identified as some of the barriers to this human right, demonstrating that it goes beyond mere access to the technology (Marshall et al., 2020). The term 'technological literacy' is used in research literature to define the technical and social strategies people employ to address interrupted access and to increase their opportunities for digital inclusion (Freeman et al., 2020). Technical literacy and government regulation are key factors in facilitating the human right of access to a reliable, affordable, and consistent internet connection.

Federal regulation in Australia is closely aligned with protecting citizen engagement on the internet, taking into account privacy, fairer market influence, and related areas (PwC, 2021). Across many levels of policy pertaining to digital access, ability, affordability, equity, and wellbeing, there have been a number of responses to concerns in the Australian context. The Australian Competition and Consumer Commission (ACCC) conducted a number of inquiries resulting in reports and recommendations, such as the *Digital Advertising Services Inquiry Final Report* (ACCC, 2021a), however these are largely focused on the markets within digital spaces and consumer experiences, and do not look to the quality of internet access for consumers. In addition to programs from the national regulator, the Federal Parliament, through the Senate, has held a number of hearings and Special Inquiries. The list of legislation pertaining to internet access is long and includes the *National Broadband Network Companies Act 2011*, *Telecommunications Legislation Amendment (National Broadband Network Measures - Access Arrangements) Act 2011*, *Telecommunications Act 1997*, *Telecommunications (Low-impact facilities) Determination 1997*, *Telecommunications Code of Practice 1997*, *Telecommunications Universal Service Management Agency Act 2012*, and the *Telecommunications Legislation Amendment (Universal Service Management Agency Regulation 2012*. The rapid expanse of internet need and usage, as well as advances in digital technologies, accounts for the constant need for update in this area of regulation and legislation. Still, policy often falls short of addressing the growing challenges of digital inequality in Australia.

The policy landscape is further complicated by factors relating to the array of technologies through which the internet is accessed and the contexts in which Australians access the internet. As previously stated, people access the internet using phone-enabled data as well as—or in place of—cabled internet. In 2020, more than four million Australians accessed the internet solely through a mobile connection using a mobile data allowance but no fixed connection (Thomas et al., 2021). The matter of access to suitable devices for internet activity also complicates policy needs in Australia. Around one in five people have no access to a personal computer at home, and therefore rely on mobile devices (smartphones or tablets) when using the internet (Thomas et al., 2021). Furthermore, a factor often overlooked in measures of internet access is the divide between regional and metropolitan Australians (see, for example, Erdiaw-Kwasie & Alam, 2016), with those outside of the cities experiencing greater disconnection.

The concept of 'technological literacy' refers to people's technical and social strategies to overcome the inadequacies of interrupted internet access (Freeman et al., 2020, p. 1947); technological literacy can thus address some of the shortfalls of policy and infrastructure. Such skills and adaptations have been identified in overcoming poor service in metropolitan Melbourne, as well as in regional and remote areas, which have been the focus of most literature on this subject. In the city, place-based challenges emerged in a range of ways in the homes of our participants. The digital divide exists in the quality of access experience, where different infrastructure and devices for connection create divergent consumer experiences (Gerli & Whalley, 2018; Philip & Williams, 2019).

NBN CO

Policy solutions to the digital divide have generally been designed around the provision of computers and internet access, largely neglecting to address the myriad social and economic factors at play (Warschauer, 2004). This is evident in Australia's National Broadband Network (NBN) policy, which aimed in part to bridge the divide in infrastructure between metropolitan and regional Australia (Morrow, 2018). Barzilai-Nahon (2006) explores the methodological reasons behind this provision-focused conceptualization of the digital divide, suggesting that policy interventions that approach the issue from a technologically deterministic perspective tend to be convenient in terms of resource allocation and can shape public opinion in favour of the investing party. Australia's NBN was touted as the answer to all internet woes for the country, but discourse has predominantly focused on infrastructure to the neglect of social and economic barriers to access.

The arrangement for the roll-out of access to the National Broadband Network is delegated to NBN Co. NBN Co is a Commonwealth company and Government Business Enterprise (GBE) that has flexibility and discretion in the management of business within the parameters of the *Public Governance, Performance and Accountability Act 2013 (Cth)*. According to the Australian Commonwealth Statement of Expectation (2021), service expectations are that NBN Co continues to upgrade the network technologies to support retailers to meet demand from end users that exceeds specified minimum requirements, including implementing current plans to expand access to peak download speeds of up to one gigabit per second. NBN Co is also charged with improving consumer experience by working cooperatively with retailers while also promoting competition between them to foster market efficiency. After some significant concerns regarding the roll-out of the program, service expectation also includes continued improvement of consumer experience for households and businesses connecting to and using the NBN.

NBN Co is expected to support retailers to meet their obligations to end users by: promptly connecting premises in the NBN footprint that are currently without access to the network; and minimising and remediating outages, persistent faults, and other issues adversely affecting broadband service levels and continuity experienced by end users.

The NBN's performance has considerable implications for digital equality in Australia, however—as noted earlier in this literature review—infrastructure is not the only area of concern for access to and use of the internet and technology. Attention to the blurred boundaries between the physical, digital, and biological spheres of people's lived experiences is essential (CRPC, 2021); a more contextualised approach to digital inequality can work to address the barriers to civic and social engagement and participation experienced by some. The market competition approach to internet provision in Australia has significant limitations and cannot fully resolve the digital divide. Prior research indicates that consumer protection must be taken more seriously to ensure equitable access to the internet and technology.

MIXED SERVICE AND SPEED

Given the common reliance on mobile data identified by researchers, it is important to consider regulation and issues pertaining to services in the 3G, 4G, and 5G mobile broadband services provided by mobile network operators (MNOs). Internationally, mobile broadband connections have become the main means of access to the internet and this trend will likely continue, given the falling price of subscriptions (Gerli et al., 2018). Performance metrics including coverage, download/upload speed, and the number of subscribers are used to measure access (Jembre et al., 2022). In Australia, the ACMA has collected data on mobile broadband usage since 2005 and reported on it in their 2018–2019 report. In an international comparison of data, Jembre et al. (2022, p. 9) identify that the current Australian market in this area is not sufficiently reported on or monitored to report on geographical location access, however they identify the following details of mobile internet data access:

- Coverage of the population from at least one MNO for 3G and 4G services reached 99.4%. In addition, there are now >400 5G-capable base stations in Australia.
- Among the total population, 96% have mobile phones and 83% have smartphones. There are around 35.9 million mobile subscribers from all MNOs, where 54%, 29%, and 15% of the total subscribers belong to Telstra, Optus, and Vodafone, respectively.
- Among the subscribers, 69% are post-paid while the rest are prepaid. This number is only slightly different from previous years.

There are various measures and assessments of the quality of services evaluated through customer satisfaction. Although coverage satisfaction has improved over time, it remains under four out of five.

The CRPC has recommended the need for effective dispute resolution pathways to enable consumers to seek redress for when things go wrong in the online space. The ACCC (2021) has also recommended the establishment of an ombudsman scheme for digital platforms, noting that it could be undertaken by the Telecommunication Industry Ombudsman (TIO). However, while that may be one way to providing ombudsman support to consumers, the CRPC (2021b) argues that issues in the digital environment extend beyond those experienced via a digital platform. They suggest there is merit in considering a Digital Ombudsman to provide support on all facets of digital experience, ranging from financial transactions to specific digital products and services, not limited to those provided via a digital platform.

Internet service providers (ISPs) manage their networks to balance performance across these different forms of access, however the ACCC's Measuring Broadband Australia (MBA) Program focuses on speed-testing, which inadvertently incentivises ISPs to optimise their network for speed, rather than for other factors (Zhang et al., 2022). Consideration of factors such as *latency* (the time taken to move data packets from the server to a user's house), *loss* (the proportion of data packets that are lost in transit), and reporting on customer experience of quality would inform a more comprehensive view of internet inclusion.

KEY IDEAS IN THE LITERATURE

During the COVID-19 pandemic digital activity cemented its transition from a consumer choice to a fundamental medium of community, service, and market engagement. Not everyone has been able to engage fully in the new digital society though. The literature highlights a range of social and cultural barriers to internet inclusion that cannot be addressed solely by attention to issues of infrastructure, and affordability. Moving to second- and third-level conceptualisations of the digital divide encourages attention to a wider range of barriers to digital inclusion, and these factors remain under-researched and not adequately understood or addressed in policy and action.

Whilst 'big' data has enabled researchers to explore digital inequality at the macro level, it has become increasingly important to understand the experiences of particular demographic communities if we are to ensure that everyone is able to take engage in society. Factors such as age, culture, language, location, digital literacy, and education levels have all been shown to have an impact on digital inclusion. Whilst issues of affordability, access, and ability continue to create barriers for many Australians, there has been little research into the everyday lived experiences of low-income earners in a city environment. Such understandings are crucial to inform action to address digital inequality. The former binary of those who 'have' and 'have-not' fails to consider the complexity involved living day to day in a world in which working with technology is essential. Such binary approaches—conceptualised as the first-level digital divide—also fail to consider the systemic flaws in a digital 'marketplace' that does not always successfully support and protect the consumer. The need for further attention to conditions of use, interactions between infrastructure elements, how products are configured, and how these factors together hape or constrains individual access is fundamental to our research.

METHODS

RESEARCHING LIVED EXPERIENCES OF DIGITAL INEQUALITY

To analyse Carlton housing estate residents' experiences with digital inequality, we developed a mixed methods approach consisting of community partner meetings, a resident's population survey, focus groups, and individual interviews. This research is grounded in the understanding that people construct meaning based on the views they bring to a common experience, in this case access to the use of technology. By drawing on a theoretical perspective that recognises the importance of people's own interpretations of their experiences, the research recognises that participants' experiences with the same phenomenon are informed by that person's individual circumstances and worldview, including their priorities and values.

To investigate the lived digital experiences of people at the Carlton housing estate it was essential that we ensured that a variety of people within the resident population were able to have their say. Our mixed methods survey, which aimed to provide an opportunity for as many residents as possible to contribute to the research, was co-constructed between members of the University of Melbourne research team (the report authors) and the community partners. Community partners supported the needs of housing estate residents, largely through publicly-funded services, such as neighbourhood houses, public libraries, and public health services. In addition to the survey, we drew on a qualitative research approach that enabled us to produce 'thick descriptions of people's experiences and perspectives within their natural settings' (Gray et al., 2018, p. 31). This involved both small focus groups and individual interviews. One of the criticisms often levelled at qualitative research is that it lacks generalisability to other populations. We sought to address this limitation by including both quantitative and qualitative methods; our approach sought to ensure that we gathered not only rich descriptions of people's experiences, but also connected those data to a broader trend of experiences with internet usage among Carlton Housing Estate residents.

PARTICIPANTS AND PROCEDURES

THE CARLTON HOUSING ESTATE

All the participants in the case study part of the project are over the age of 18 and living (or have lived in the past two years) in the Carlton Housing Estate. Further information regarding participants is provided in the findings section. General information regarding the Carlton Housing Estate (below) has been provided by the Carlton Neighbourhood Learning Centre's 'Make It Work' program, which draws on 2016 ABS Profile data. There is currently no data available from the 2021 Census, so when reporting on the survey data, we often turn to the 2016 census data to ascertain the extent to which the local community housing population is represented. However, these comparisons should be treated with caution because public housing estate populations can change significantly over short periods.

There are nine buildings in the Carlton housing estate, many of which are multi-storey and house multiple units. They are:

- 20 Elgin Street – 96 Units
- 141 Elgin Street – 96 Units
- 38 Elgin Street – 112 Units (new)
- 495 Cardigan Street – 50 Units
- 510 Lygon Street – 152 Units (12 Levels)
- 480 Lygon Street – 180 Units (9 Levels)
- 478 Lygon Street – 180 Units (9 Levels)
- 530 Lygon Street – 110 Units
- 522 Drummond Street – 84 Units

Within these buildings there are many languages spoken. In order to reach as many people as possible we focused on the ten most commonly spoken languages, which included: Arabic, Amharic, Cantonese, Mandarin (Chinese simplified & Chinese Traditional written), Plain English, Oromo, Tigrinya, Turkish, Somali, and Vietnamese.

CARLTON PUBLIC HOUSING ESTATE DATA
LYTTON, LYGON AND ELGIN STREETS

OPEN DOOR TARGET AUDIENCE

CARLTON HOUSING ESTATE
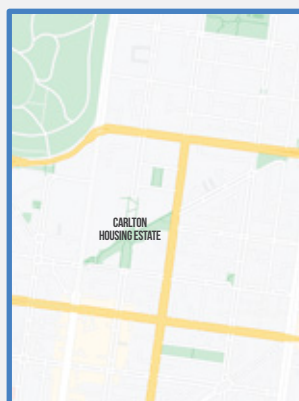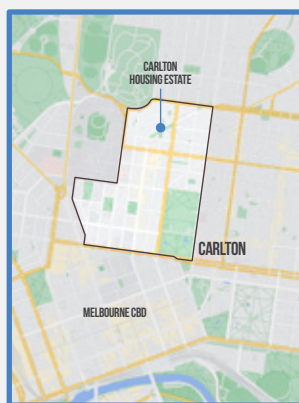
OPEN DOOR IS A NEW COMMUNITY HUB HOSTING ON THE CARLTON PUBLIC HOUSING ESTATE, AND SUPPORTED BY CARLTON NEIGHBOURHOOD LEARNING CENTRE. THE PURPOSE OF THIS HUB IS TO HELP LOCAL MIGRANT AND REFUGEE COMMITIES FIND MEANINGFUL EMPLOYMENT, STRENGTH COMMUNITY CONNECTION, AND IMPROVE INDIVIDUAL WELL-BEING.

CARLTON HOUSING ESTATE
CARLTON
MELBOURNE CBD

CARLTON HOUSING ESTATE

HOUSEHOLDS

HOUSEHOLD COMPOSITION

63% FAMILY **16%** LONE **6%** GROUP

OWNERSHIP

68% HOUSING AUTHORITY **5%** OWNED BY RESIDENT **8%** PRIVATELY RENTED

EMPLOYMENT

LABOUR FORCE STATS

24% NOT APPLICABLE
41% NOT IN LABOUR FORCE
11% NOT STATED
7% UNEMPLOYED

OCCUPATION

4% COMMUNITY AND PERSONAL SERVICE WORKER

3% LABOURER

3% PROFESSIONAL
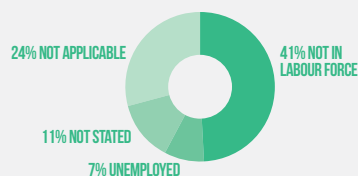
CULTURAL INDICATORS

HOUSEHOLD COMPOSITION

51% BORN OVERSEAS

9% SOMALIA
7% CHINA
4% ETHIOPIA/ VIETNAM/ERITREA

TOP LANGUAGES SPOKEN

58% SPEAK A LANGUAGE OTHER THAN ENGLISH AT HOME

19% SOMALI **12%** ARABIC **6%** MANDARIN

ENGLISH PROFICIENCY

43% VERY WELL **32%** WELL **19%** NOT WELL **5%** NOT AT ALL
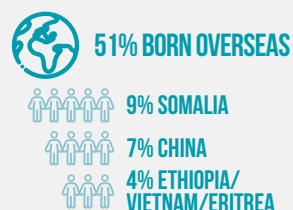
EDUCATION

HIGHEST LEVEL

22% POST YEAR 10 SECONDARY **8%** BACHELOR DEGREE **6%** VOCATION CERTIFICATE

STUDYING STATUS

8% HIGHER EDUCATION, UNIVERSITY

10% PRE-SCHOOL PRIMARY, SECONDARY

3% VOCATIONAL (TAFE OR SIMILAR)
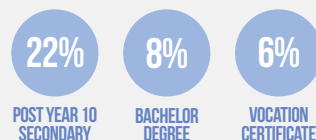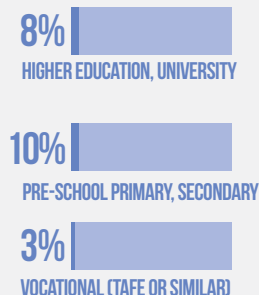
DEMOGRAPHICS AT A GLANCE

24 MEDIAN AGE

48% FEMALE **52%** MALE

$338 MEDIAN CARLTON WEEKLY INCOME

$211 MEDIAN CARLTON HOUSING ESTATE WEEKLY INCOME

UNDERSTANDING DIGITAL INEQUALITY

During the time of our research project several households from the Carlton Housing Estate were moved as part of a COVID-19 re-housing project. This meant that what started out as a reported population of approximately 3000 people was reduced. Data obtained from the Department of Families, Fairness and Housing (DFFH) has confirmed that multiple households were moved during the first seven months of 2021. Whilst we were unable to obtain a comprehensive list, we can confirm that at least 33 households (encompassing 141 people) moved during this period. They were relocated to a range of locations including Brunswick, Point Cook, and Glenroy. These three destinations had more than one household relocated to the area.

The Carlton Housing Estate Buildings are serviced by the NBN with Fibre to the Building (FTTB) and have recorded speed tests of 86–100mbps. Across the whole estate about 50% of the approximately 1000 households have NBN broadband accounts.

COVID-19

This research was initially intended to investigate the experience of people living in the Carlton Housing Estate during the 2020 COVID-19 lockdowns, once the lockdowns had ended. Melbourne's 2020 lockdowns were:

- Lockdown 1: Tuesday 31st March 2020 to Tuesday 12th May 2020. A total of 43 calendar days.
- Lockdown 2: Thursday 9th July 2020 to Tuesday 27th October 2020. A total of 111 calendar days.

At the time the research was conceptualised it was hoped that the pandemic was a thing of the past. Unfortunately, this was not to be the case and several further lockdowns affected both the city and the research project. Following each lockdown there were further restrictions remaining in place that rendered it difficult to undertake face-to-face data collection. We started the research in January of 2021, but have been impacted by four lockdowns that have taken place in Melbourne during that time:

- Lockdown 3: Saturday 13th February 2021 to Wednesday 17th February 2021. A total of five calendar days.
- Lockdown 4: Friday 28th May 2021 to Thursday 10th June 2021. A total of 14 calendar days.
- Lockdown 5: Friday 16th July 2021 to Tuesday 27th July 2021. A total of 12 calendar days.
- Lockdown 6: Thursday 5th August 2021 to 21st October 2021. A total of 79 Calendar days.

The lockdowns and pandemic restrictions have required a greater reliance on digital data collection approaches than we anticipated. There were significant periods when we could not visit the Estate, or approach individuals or households in person. This of course means that the very people we most want to contact have been uncontactable for much of the year.

CO-DESIGN WITH A NETWORK OF COMMUNITY ORGANISATIONS

Co-design with community was an important feature of our approach to the research. We decided on the tools for generating data through rounds of co-design with our Carlton community partners, and a wider network, known as Combined Agencies for Digital Inclusion (CADI). In 2020, this group came into existence in response to COVID-19 lockdowns. Members representing neighbourhood houses, learning centres, local government, and community organisations came together to share information and strategies to support the digital inclusion of disadvantaged people, including social housing residents and pensioners. The network sought collaboration with academic researchers, and so we attended monthly online meetings discussing digital exclusion in all its dimensions, exploring possible responses at community, university, and government level. The device donation scheme co-ordinated by the University of Melbourne's Community Engagement manager Kerrii Cavanagh with the Carlton Neighbourhood Learning Centre's Elle Morrell represented a core relationship from which other university-community relationships continued to evolve over the research period. For example, several researchers on our team have been actively involved in one-on-one digital mentoring with Carlton public housing residents as a result of CADI connections.

CADI members are involved in community work that increasingly requires digital access, including adult education courses, community building projects, youth and mentoring programs, childcare, and digital skill-building programs. CADI members include: Carlton Neighbourhood Learning Centre, Kensington Neighbourhood House, The Centre, Farnham Street Neighbourhood Learning Centre, North Melbourne Language Learning (NMLL), Belgium Avenue Neighbourhood House, Wingate Avenue Community Centre, The Venny, North-East Neighbourhood House Network, Neighbourhood Houses Victoria (NHVic), Adult and Community Education Victoria (ACEVic), Network West, Victorian Public Tenants' Association, Older Persons High Rise Support Program – Star Health, Unison Community Housing, Adult Learning Australia, University of Melbourne, NBN (Community and Stakeholder Engagement), Australian Communications Consumer Action Network (ACCAN), InfoXchange, Yarra Libraries, City of Yarra, and City of Melbourne.

The processes of co-design were informed by the guidelines in figure 2.

	FEATURES OF CO-DESIGN
	Co-design is person-centred, using ethnographic methods to understand the experience of a service from the clients point of view. Co-design asks service providers and service users to walk in the shoes of each other and to use these experiences as the basis of designing changes.
	Co-design starts with a desired end rather than with what is wrong with the present service. In the process we look for ways to build backwards from the outcomes we are seeking. This not only stops us from getting bogged down in what's wrong, it also potentially leads to realisations that the problems we thought we were facing were not the real' problems!
	Co-design is focused on developing practical, real-world solutions to issues facing individuals, families and communities. In co-design processes, prototyping is a method of testing whether ideas work in practice, and then refining ideas until solutions that work for service users and providers alike are developed.
	Co-design makes ideas, experiences and possibilities visible and tangible using a variety of media, graphic, kinesthetic and experiential methods. This helps to make solutions tangible and to make complex systems accessible across a range of people who may have different perspectives and knowledges about the system.
	Co-design processes are inclusive and draw on many perspectives, people, experts, disciplines and sectors. The idea is to find real. workable solutions to complex issues, so it is important to draw on many perspectives, to challenge orthodoxies, to question assumptions, and to draw in other possibilities. Co-design processes thrive when boundaries are flexible and silos are broken down, when real listening and dialoque can occur across unlikely alliances.

Figure 2: Burkett (n.d.) An Introduction to Co-Design, Centre for Social Impact, UNSW, Sydney.

The research tools were developed by the academic researchers and were informed by the research literature, but their format and content were generated in a process of discussion with representatives of community organisations. These community partners provided pertinent information to guide the development of tools for data collection and helped to ensure that the tools would be accessible to participating Carlton Housing Estate residents.

DIGITAL INCLUSION SURVEY

Researchers developed a self-reporting survey research instrument that was informed by the Australian Digital Inclusion Index (ADII) as it was structured up until 2021. We chose to focus on the same three themes of digital access, affordability, and ability outlined in the 2020 report, to enable analysis and comparison of results next to the ADII dataset. Questions on the survey were not compulsory and as such participants could simply move on if they were uncomfortable answering any of the questions.

The first section of the survey focused on individual demographic information such as age, gender, level of education, employment, and income. The next section of the survey focused on access by asking about the type, age, and number of devices in the household, as well as a series of questions regarding how, where, and how often participants access the internet. The third section of the survey explored participants' digital ability levels by asking participants to agree or disagree with a series of statements regarding what they use technology to do—such as checking a bank balance—and their disposition regarding technology—such as 'computers and technology give me more control over my life.' Participants were also asked to indicate whether their ways of engaging with and through technology had changed in three periods of time: before the lockdowns, during 2020 lockdowns, or never.

To ensure the survey was fit for purpose it was reviewed by the network of partner organisations and a community liaison researcher and assistant, who ensured it suited the experiences and access needs of the highly diverse target population of Carlton Housing Estate residents. After receiving ethics approval from the University of Melbourne, the survey was distributed through our community partners and by our community liaison researcher who spoke Arabic and Somali and lived within the Estate, with the support of the larger team. The survey was also translated into some of the most commonly spoken languages on the estate: Amharic, Arabic, Chinese, Somali, Spanish, Tigrinya, Turkish, and Vietnamese. The survey could be accessed digitally through a QR code or link as well as in a paper version. Posters were placed around the community and in local libraries and the research was discussed in the local newspaper. Researchers also sat at the entrances to the buildings and undertook some door-to-door dissemination.

The community liaison researcher and assistant brought a familiarity with the resident groups as well as proficiency in key languages spoken by many residents. This was vital to the completion of this research component. Recruitment for these roles was informed and supported by our Carlton Neighbourhood Learning Centre partners, which enabled us to recruit participants from their networks and gave us access to the residents of the estate. Researchers who have previously worked with Melbourne public housing estate communities have achieved high survey response rates due to the efforts of community researchers familiar with language and cultural groups on the relevant estates.

THE SURVEY SAMPLE

There were 141 respondents to the survey, which remained in the field for a full year. A number of participants did not complete all the elements of the survey and as such frequency data has been provided for each question.

Of the 25 people who answered the question regarding their location, 80% lived in the Carlton Housing Estate. However, 20% of the respondents had previously lived in the Estate but moved out during the COVID-19 period.

As can be seen in figure 3, approximately half of the survey respondents who supplied their age were under 34 years old, with almost one quarter of the respondents between the ages of 18–24. When compared with 2016 Census data for the Carlton Housing Estate, it appears that this younger age group is over-represented in our survey data. In 2016 Census data, 20–29 year-olds made up only 12% of the population.
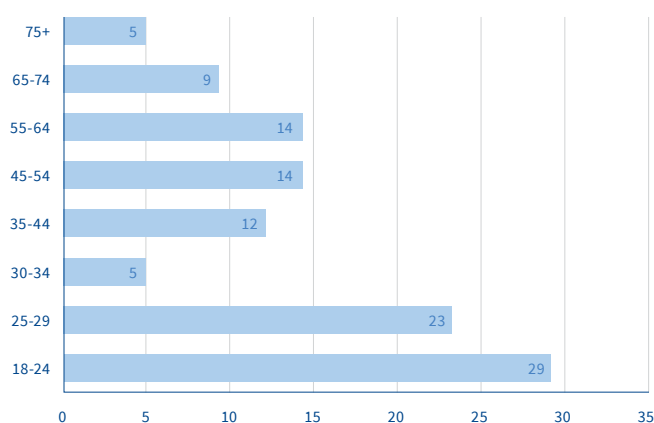
Figure 3: Survey participants by agents by age (n=111)
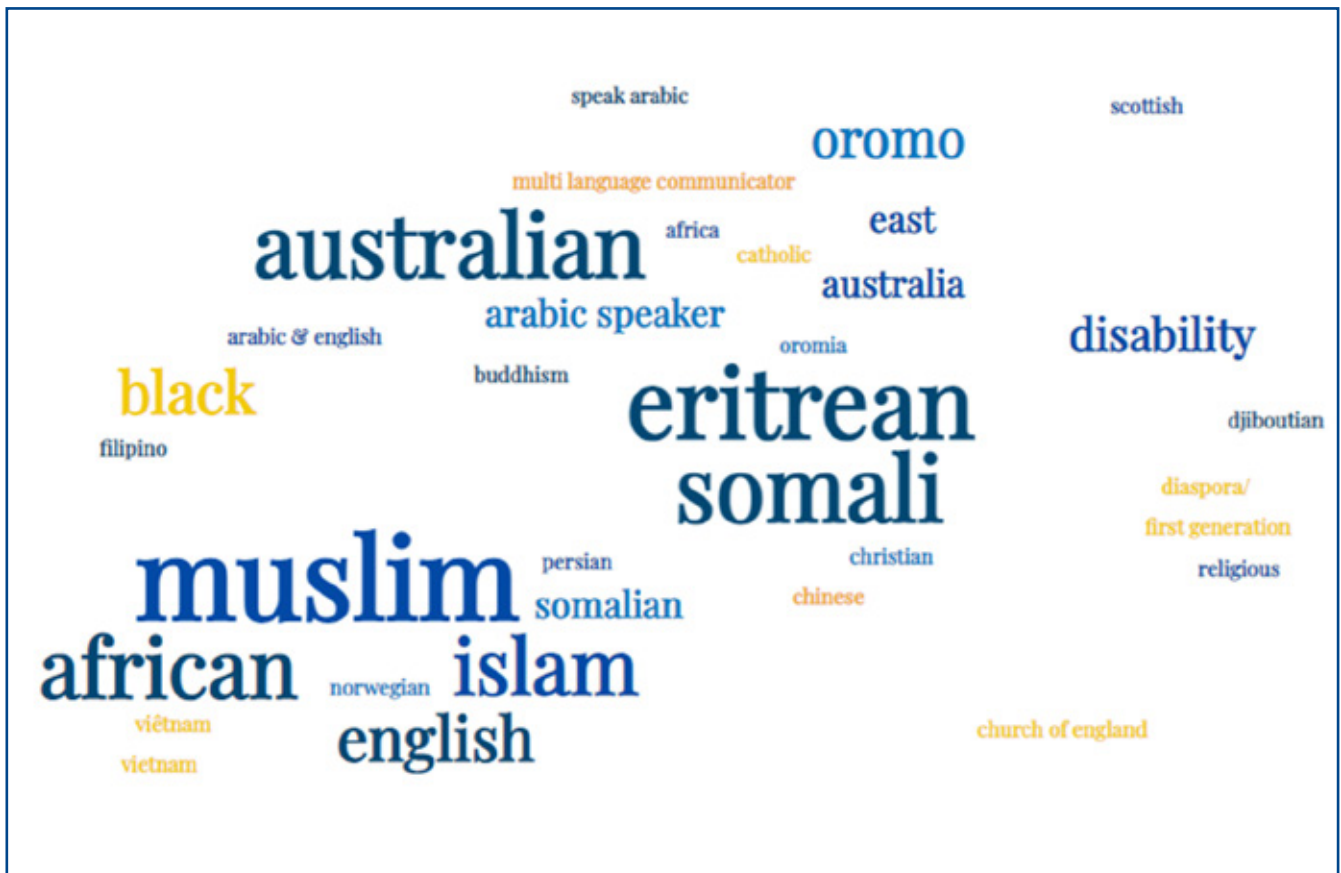
Figure 4: Word cloud of self-identifiers (font size indicates frequency)

Of the 104 participants who supplied a gender, just over 70% identified as female, and almost 30% as male, whereas in the ABS 2016 Census data, 55% of the estate identified as female and 45% as male. As such, female participants are over-represented. When we investigated further, we found many responses from women who speak Somali and English, or Arabic and English, particularly in the lower age categories. When we discussed this with our partners and community liaison researcher they were not surprised by higher levels of female participants from the Horn of Africa, noting that many of the services they offer are taken up by this group. The community liaison researcher also identified as a young woman of Somali heritage, so it was perhaps unsurprising that in her outreach into the housing estate, her own community were most likely to take part in the research.

Participants were also given the opportunity to provide up to five other identifiers they might use to describe themselves. As can be seen in the word art based on the frequency of the responses (Figure 4), many respondents identified themselves through their religion, language group, or ethnicity.

When asked about the languages they spoke, participants were largely bilingual, with some identifying as trilingual (see Figure 5). Of the 99 survey participants who responded to this question approximately half spoke English and at least one other language (Somali, Arabic), and almost a third spoke a language other than English with rudimentary English skills. The final group of participants were monolingual English speakers.

NOTE: The 'maybe +1 other' in brackets for some categories indicates that, in a very small number of cases, there was a second or third language spoken in the home.
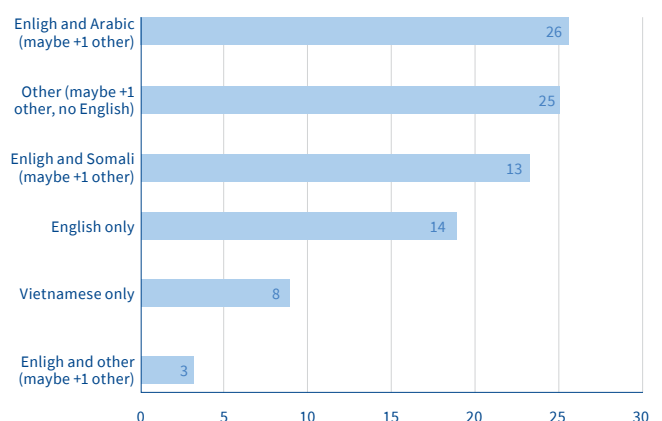
Figure 5: Survey participants by agents by age (n=111)

Figure 5: Participant languages spoken (n=99)

FOCUS GROUPS

To gain a deeper understanding of the role that digital technology plays in the day-to-day lives of our participants, we also ran focus groups. Q-sort methodology was used to investigate the perspectives of participants who represent different stances on an issue, by having participants rank and sort a series of statements. Q-Sort activities can be very helpful in unearthing perspectives without requiring participants to articulate these clearly themselves. One Q-sort should produce two sets of data. The first is the physical distribution of sorted objects. The second is either an ongoing 'think-out-loud' narrative or a discussion that immediately follows the sorting exercise.

Q-SORT ACTIVITY

Focus groups brought together people with similar experiences or backgrounds (Table 1).

In each focus group participants were asked to rank the following statements using a Q-Sort technique. Once participants had done this individually (each q-sort was photographed), they were asked to try and build a group ranking. When undertaking this process participants were asked to provide their reasoning for their choices (see Figure 6).

Figure 6: Focus Group Q-sort Image

TABLE 1: FOCUS GROUPS

	MODE	DATE	NO	AGE RANGE	GENDER	CULTURAL BACKGROUNDS
1	Online	11 Oct 2021	4	18–30	Female	Horn of Africa
2	Online	19 Oct 2021	3	Mixed	Male	Horn of Africa/Southeast Asian
3	Online	28 Oct 2021	4	18–30	Female	Horn of Africa
4	In person	23 Nov 2021	8	50–80	Female	Eritrean (interpreted)
5	In person	13 Dec 2021	6	20–70	Mixed (2M/4F)	Vietnamese (interpreted)

PARTICIPATORY MAPPING INTERVIEWS

One-on-one interviews were conducted to offer residents the opportunity to discuss social tensions and economic challenges they experience in relation to internet use. We set out to understand how access to internet and devices is distributed between members of households, for example between people of different generations, genders, or people enrolled in work contracts or education programs of different status or importance to the household. Detailed questions about tensions are best addressed in confidential, personal interviews. For this reason, an interview instrument was developed to provide an intimate understanding of the politics and competing interests that play out in the household. The qualitative interviews sought data about how these might intensify when social activities such as working and learning move online in a socio-economically disadvantaged area.

The interviews were accompanied by a participatory mapping exercise. Visual research methodologies are a powerful way to include marginalised people in research and engage people in conversations about everyday places and spatial practices. For example, participatory mapping has been used to include at risk communities such as informally housed people (Allen et al., 2015), migrants (Moskal, 2015), and young people (Literat, 2013; Swords et al., 2019) in charting environmental hazards, community assets, and travel routines (see, for example, Wilson et al., 2019). Mapping has also been used to complement interviewing, for example in research into the cultural meaning of the home (see, for example, Brickell, 2012). In these contexts, visual exercises have offered opportunities for people to engage in storytelling about the topic at hand because visual prompts and activities soften language barriers. To ensure that the research method was inclusive to people with different skills and abilities, including variations in English language proficiency and command of technical vocabulary, the interviewees were first asked to use floorplans, figurines, and markers provided by the researchers to map digital devices and internet connections in their home (see Figure 7).

Figure 7: Interview map drawn by interview participant.

The mapping exercise was useful for gaining insight into the spatial and social configurations in which residents access the internet. It formed an illustrative tool against which participants could subsequently answer questions about their internet use with the support of their diagrams. Interviews were used to gather detailed insight into household members' digital practices at different times of the day. Questions focused on the digital routines of individuals in the household and any tensions and pressures around the use of devices, internet connections, and spaces in the home and elsewhere in the city by members of the household during lockdown and during routine weeks. Interviewees were asked how they managed these pressures and how this impacted different household members' lives. For example, we asked residents which household members use which rooms in the house to use the internet, and whether they experienced different quality internet connections in different rooms.

Between December 2021 and February 2022, six participatory mapping interviews were conducted that lasted between 30 and 60 minutes each. Three interviews were conducted in-person in a private room in a public library, with the assistance of a Vietnamese interpreter. Of the remaining three interviews that were conducted in English, one was conducted in person and two were conducted online (see Table 2).

ANALYSIS

All case study data was analysed using the framework of accessibility, affordability, and ability that has been developed and is continuously being modified by the Australian Digital Inclusion Index. This multi-method, multi-level analysis was conducted on the academic side of the research partnership, but was presented in stages to the community partners in CADI. As a result, the minutes and notes from these presentations and the ensuing discussions provided contextual detail to inform our analysis and understanding of the local factors that might be contributing to the experiences of the residents.

TABLE 2: INTERVIEW PARTICIPANTS

	MODE	DATE	AGE RANGE	GENDER	CULTURAL BACKGROUNDS
1	Online	13 Dec 21	30s	Male	Vietnamese
2	In person	18 Feb 22	30s	Female	Horn of Africa
3	Online	21 Feb 22	25	Female	Horn of Africa
4	In person	25 Feb 22	70s	Male	Vietnamese (interpreter)
5	In person	25 Feb 22	50+	Female	Vietnamese (interpreter)
6	In person	25 Feb 22	40s	Female	Vietnamese (interpreter)

FINDINGS

CASE STUDY ANALYSIS: THE CARLTON HOUSING ESTATE

ACCESSIBILITY

The most recent ADII report showed that while accessibility was improving for most Australians, social housing tenants continued to be at risk of being left behind. According to the 2021 report, 25.12% of social housing tenants were mobile-only users, compared with 9.6% of the general population. When analysing the accessibility of the internet to which participating Carlton Housing Estate residents could connect, the research focused on the devices and the types of internet connections and subscriptions that were available in households, and examined how access to these resources was negotiated and distributed among individual members of households.

Within the Carlton housing estate there was a range of devices in use across different family groups. Participants' survey data confirmed that the average number of devices per household was between three and four. However, when compared to the number of people in the household, it became apparent that there were some households with very few people and many devices; whilst other households had many people and very few devices. In fact, in the households with more than six people living in them (n=7), only one had more than four devices, while in the 25 premises with two or three people in the household approximately half had more devices than people. As Figure 8 below indicates, the most commonly owned device was a smart mobile phone that was less than five years old, followed by the same type of device but over the age of five. During the pandemic, some of our participants (approximately 20%) were provided with equipment such as laptops, desktop computers, and tablets by their community organisations or their schools. We should note that in interviews and focus groups several of our participants stated that they had needed to purchase additional devices due to COVID-19 lockdowns. One of the interview participants explained that lockdown made it necessary to buy two more laptops for her children, who were all in full-time education.
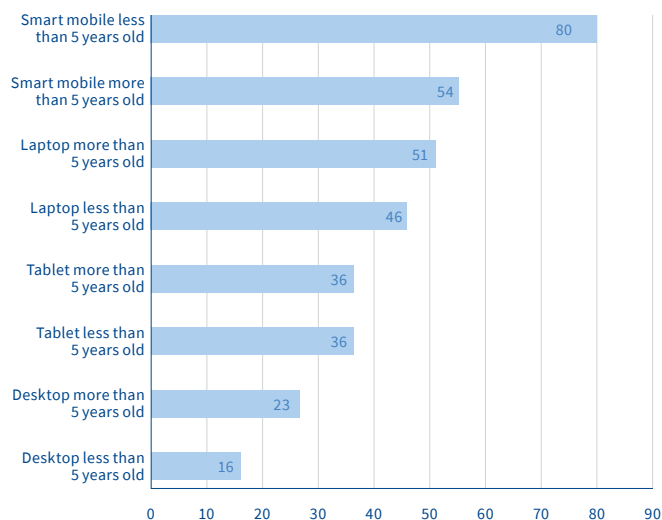
Figure 8: Device ownership (by percentage of participants)

When asked how often they accessed the internet, 69% stated they used it every day, and 27% indicated they used it most hours they were awake. Remaining participants who responded to this question stated that they used it weekly or monthly.

The survey indicated that most people living in the Carlton Housing Estate were able to access the internet at home. Of the people who responded to our survey question about how they access the internet, about 3% stated they did not access the internet, 10% only used their mobile phones, and 38% usually accessed the internet through a modem. However, the majority of respondents (63%) accessed the internet through a combination of modem and a mobile phone connection. When this was discussed in focus groups and interviews, one of the reasons participants felt they needed both modem and phone access to the internet was the lack of reliability of their NBN internet connections.

Most of the 25 residents who participated in the five focus groups had an NBN connection, and of those users many reported that their connection was unreliable. Research participants explained that their NBN connection would frequently be too slow to engage in common activities like streaming, conference calling, or emailing.

For example, this focus group participant reported:

Facilitator: Okay. Yeah. And so you need good internet for that. Are you watching on your phone or are you watching..?

> *Participant: Um, so I used to watch on my laptop, but like, with a child, it's not really possible because I'll be with her when she's napping and whatnot. So I've switched to my phone now, but I do use like obviously, like just the actual like internet for the blank, the modem, so I'm not using my my own data and sometimes it is slow which is really frustrating. But when that happens, I just kind of turned to my own data but yeah. (Focus group 3)*

Research participants consistently reported that their internet connections on their phones were much more reliable than their NBN connections. One participant reported that she only found how bad her home connection was when COVID-19 lockdowns forced her to use it.

> *Participant: I only noticed that I think maybe because [previously] I was constantly using the home internet. Because when I'm not working, I prefer to use my data, rather than the home internet. It's just faster and easier for me. So, do most people in my house. But when I was working…*

Facilitator: Could you – yeah, sorry.

> *Interviewee: Yeah, you go.*

Facilitator: I just wondered what you mean when you say that it is easier to use the data rather than…

> *Interviewee: Oh, it's just things don't lag, it's just like if I have the data, I will just use the data, because I know I'm not going to have problems with…*

Facilitator: So, it's more reliable?

> *Interviewee: Yes. Yeah. Definitely more reliable (Interviewee 3)*

Whenever the NBN connection failed, participants used their phone as a back-up. Concurrently, people reported that the phone hotspot option only accommodates one or two devices, meaning that household members were dependent on individual phone plans at such times:

Facilitator: Do you find as well, for example, if you were in [the second bedroom] and you're hot spotting from your phone, can other members of the household, can your family members use the internet at the same time, or you wouldn't do that?

> *Interviewee: I wouldn't do that, not recommend it because the signal is very weak if you use two devices connected at the same time. We're not recommended to do this unless we don't use much heavy-duty things, heavy duty tasks like Zoom, maybe okay just checking email we can connect two devices at the same time, but if one of the device we are using for Zoom, I don't think it works well. There's going to be a glitch. (Interviewee 1)*

The focus group and interview participants did not discuss tensions between household members at great length as the vast majority found ways to accommodate the work, education, and entertainment needs of household members. When such struggles were brought up, participants commonly stated that they gave priority to education.

Facilitator: So if there are a lot of people in your [home] who gets to use the internet?

> *Participant: Everyone. In my family everyone [over-speaking]*

Facilitator: Even the little ones?

Interpreter: So she's saying students. Students get priority. (Focus group 4)

One focus group and interview participant described the way the unreliability of their NBN connection meant that her working from home tasks and her children's home schooling needed to be coordinated within the limitations of the fluctuating availability of bandwidth.

Interviewee: *Oh, all the time [laughs]. All the time. It's tricky because when - especially when I'm on Zoom. I actually have to go out of my room and make an announcement to everyone to turn their Wi-Fi off, so I can attend the meeting… (Interviewee 2)*

This participant described the effort and financial cost she was forced to expend to ensure access for herself and her children:

Facilitator: How did you find the coordinating - like if you were doing your work and you could only have one household member be on a Zoom call at once, how did you make sure that you didn't have - like that you didn't have two people who needed to make a Zoom call at the same time?

Interviewee: Then I emailed the link - my Zoom meeting link to my personal phone and used the data. Or the work phone and used the data, to attend the meeting and just to make sure that my son is actually able to attend.

Facilitator: Oh yeah. So it wasn't like a bit - so like, you would try to have separate times but if you had an overlapping one, you would use the extra data.

Interviewee: Yeah. (Interviewee 2)

The 2021 ADII reconsidered its conceptualisation of affordability to ensure that it reflects the importance of a good quality internet connection. The latest report states that 'a rudimentary connection may be relatively inexpensive but is no longer an adequate basis for digital inclusion' (Thomas et al., 2021, p. 4). The results from our study reinforce ADII's insight that accessibility must also be considered in this light. Together, the survey, focus group, and interview results indicate that access to reliable and sufficiently fast internet is not a mere matter of affordability, but also of uneven accessibility as public housing residents are offered a substandard service.

There is an assumption in the ADII measurement of access that mobile use is not the best way to access the internet, but the focus group and interviews demonstrated that consumers have a far more reliable experience using the internet over their phones directly (which is not an ideal platform for full days of working on a screen) or by hot spotting (using phone data to connect their computer/ tablet to the internet).

AFFORDABILITY

The ADII previously considered two components of affordability: the relative share of household income spent on internet access and the total internet data allowance per dollar of expenditure. Its most recent report adjusted the approach to affordability to consider what percentage of income a household would need to spend to gain quality, reliable connectivity. It adopted this new approach to acknowledge that many internet plans now offer unlimited data, making the data allowance per dollar component redundant, and to acknowledge that the internet's usefulness is affected by reliability. Based on this new approach it calculated that 'for Australians in the lowest income quintile, most (67%) would have to pay more than 10% of their household income to gain a reliable connection' (Thomas et al., 2021, p. 6).

In the survey, 73 participants were comfortable indicating their household income. The relevant survey item included additional categories of 'do not know,' which garnered a response from 20 people, and 'prefer not to answer', to which 19 people responded. Results for the remaining 73 respondents are below in Figure 9.

Figure 9: Household Income (n=73)

- (11%) < $10,000
- (30%) < $10,000 – $19,999
- (20%) < $20,000 – $29,999
- (11%) < $30,000 – $39,999
- (7%) < $40,000 – $49,999
- (7%) < $50,000 – $59,999
- (14%) < $60,000 – $69,999
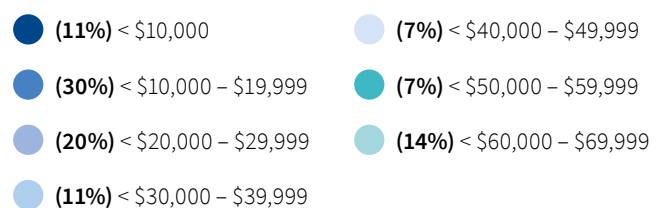
According to The Melbourne Institute of Applied Economic and Social Research, the poverty line for Australia to the March quarter in 2021, inclusive of housing costs, is $1,091.50 per week for a family comprising two adults, one of whom is working, and two dependent children. Within the survey, participants were asked to disclose how many people live in their household. Figure 10 highlights that just over half of the participants were living in households of four or more people. By comparing the financial and household number information to the poverty line figures supplied by The Melbourne Institute of Applied Economic and Social Research (Poverty-Lines-Australia-March-2021.pdf (unimelb.edu.au)) we estimate that approximately 60% of our survey respondents are living below the poverty line.
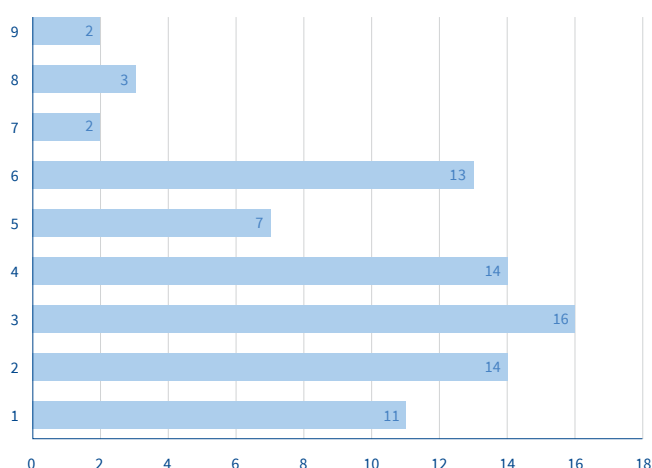
Figure 10: Number of People in Household (vertical axis) (n=82)

The cheapest unlimited NBN internet plan found through www.comparebroadband.com.au on the 24th of April, 2022 was $59.90 per month ongoing. This has been advertised has having a standard speed of 25 Mbps. Advice regarding internet speeds suggests that a speed of about 25 Mbps will allow up to two devices to surf the web and check emails. The common recommendation is that for a group of 2–4 people who are working from home and streaming internet services, 50–100 Mbps is needed. Unlimited internet plans operating at these speeds vary from $70–$140 monthly.

Focus group participants and interviewees indicated that unreliability is a prominent characteristic of affordable internet; their comments offered the insight that affordability and reliability must be considered in tandem. Reliability is a variable trade-off in consumer choice, but it comes without standards or guarantees of actual reliability post-purchase. People invest in upgrading plans and devices for a *chance* of better reliability.

Facilitator: *Okay, and do you know if it's NBN?*

   Interviewee: *Yes it is.*

Facilitator: *Okay. And, did you switch to NBN, because you wanted a better connection?*

   Interviewee: *Yes.*

Facilitator: *and did that work?*

   Interviewee: *no (Interviewee 2)*

The many different components that must work together to produce a reliable internet connection (a data plan with a particular provider, a phone or other device, a modem) obfuscate the diagnostic process and make it impossible for people to identify which component is making their internet lag. As a result, people resort to a process of elimination by trial and error to identify what is causing unreliability. Each trial consists of replacing a piece of the puzzle and comes with costs that in themselves do not guarantee improved quality or reliability. The interviewee above invested in NBN. The following focus group participant invested in a new modem:

Facilitator: *Okay, because it's not working so well from your, from your home modem?*

   Participant: *Yeah. So we've been going back and forth, but we finally got a new modem today. So, fingers crossed, it works again, but so last few weeks we haven't had the, best, um any internet connection at all. (Focus group 3)*

When investments do not lead to remedies, people are commonly forced to spend more to remain connected. Interviewee 2 went on to estimate that she spent about $40 per month extra to remain connected while having committed to an unreliable NBN connection. And the focus group 3 participant said that she was not sure how much hot spotting her way through lockdowns with unreliable internet had cost her:

   Participant: *luckily my phone. I've got a lot of data so I was just running through it. Running my laptop off my phone hotspot.*

Facilitator: *So you so you didn't end up having added costs because of that?*

   Participant: *Haha, to be honest, I'm not too sure, I haven't gotten my phone bill yet and I've been having issues with the Optus app […] they kept saying 'oh we'll come' and then they didn't. And the intercom for my house wasn't work and they would just call that not call us on the phone. So it was a bit of a struggle. (Focus group 3)*

This participant's quote illustrates that the tools she was provided with to stay within her budget by the internet provider were as unreliable as the internet connection. While the system is based on the model of a free market populated by rational and fully informed consumers, the ability of these consumers to make fully informed decisions and exercise their consumer choice is hampered by a reliance on providers to give in-real-time insight into expenditures.

The following focus group participant reported that in addition to costs related to the unreliability of internet, contracted use of the internet is also experienced as being highly unpredictable.

I know as a matter of fact is some families who kind of sign it with whatever without mentioning a particular one. Telstra Optus… One of the well-known ones and then all of a sudden they found out there's some weird, you know, contractors, they didn't know it… and then they, or for example - a family will sign $100. A month nothing…. they will not receive anything else. But for some reason they receive a $150 or $200 bill and they get surprised and company cannot explain to them and they disconnect it. They just say this is, you know I don't understand what's going on. So confusion and being complicated is one of the things I found it. It might not be that expensive, but in terms of how complicated…. and then they lose trust and I think. (Focus group 2, emphasis added)

This focus group participant explained that the perceived unpredictability of costs made some residents no longer trust telecommunication providers. The unpredictability of costs was also reported by research participants with children.

Facilitator: Okay. Did [your children] use a lot of data when they were studying at home? Are they in school?

Interviewee: [Interpreted] Yes, we have a lot of data.

Facilitator: But you have unlimited plan?

Interviewee: [Interpreted] Limited.

Facilitator: Did you have to spend more money when we were in lockdown?

Interviewee: [Interpreted] Seventy more a month.

Facilitator: Okay. Does that ever happen and surprise you? Sometimes my son will use a lot of data, and my bill will be very high, does that ever happen to anyone else?

Interviewee: [Interpreted] They all smile now, they're using unlimited, so now - before they haven't. They haven't before [unclear] bill send surprise, real surprise. (Focus group 5)

Various participants in this focus group agreed that the unpredictability of internet costs in a household with children made a more affordable data plan with a limited data allowance a risky option. While the most recent ADII report revealed that households with children are 'the most digitally included Australians' (2021, p. 7), our findings indicate that this might be despite households' limited ability to afford this degree of connectivity.

DIGITAL ABILITY

According to the ADII, digital ability is comprised of a person's attitude, basic skills, and the types of activities they are happy to engage in online. In research literature on digital divides and digital disparities, scholars also consider people's ability to solve technical difficulties, sometimes referred to as a technological literacy, and their ability to translate their digital skills and affordances into meaningful activities and outcomes (Freeman et al., 2020).

Residents who participated in the survey answered questions about their general attitudes to digital technology and questions about specific tasks they did or did not perform online. When asked about their attitudes to technology, approximately 90% felt that technology gave them more control over their lives and stated that they liked to have access to the internet everywhere. However, 70% of survey participants reported that technology is changing so fast that it is difficult to keep up with it, and only half indicated that they go out of their way to engage with new technology.

In the survey, participants were asked to agree or disagree with several statements regarding their ability to use the internet. Figure 11 below shows participants' responses. As can be seen in the response numbers, not all respondents answered each statement, so the graph demonstrates the results as a percentage of each individual statement response rate. Over 90% of participants were able to use their smartphone to access the internet, demonstrating that mobile phones have become a very common way for people to access the internet both at home and when out and about. In the survey 32 discrete online activities were mentioned. There were two participants who did not use the internet at all and one participant who used the internet for every one of the 32 items. However, 19 was the average number of actions most participants could do online.

Even when making these technical adjustments to access, focus group participants indicated that poor quality service had an impact on their work and study, with one focus participant identifying that the lag in message delivery on their phone service meant that they missed shifts and other casual work opportunities, and another participant explaining that she felt she was seen as unprofessional in work situations because her Zoom connection was inconsistent and did not allow her to keep her camera on.
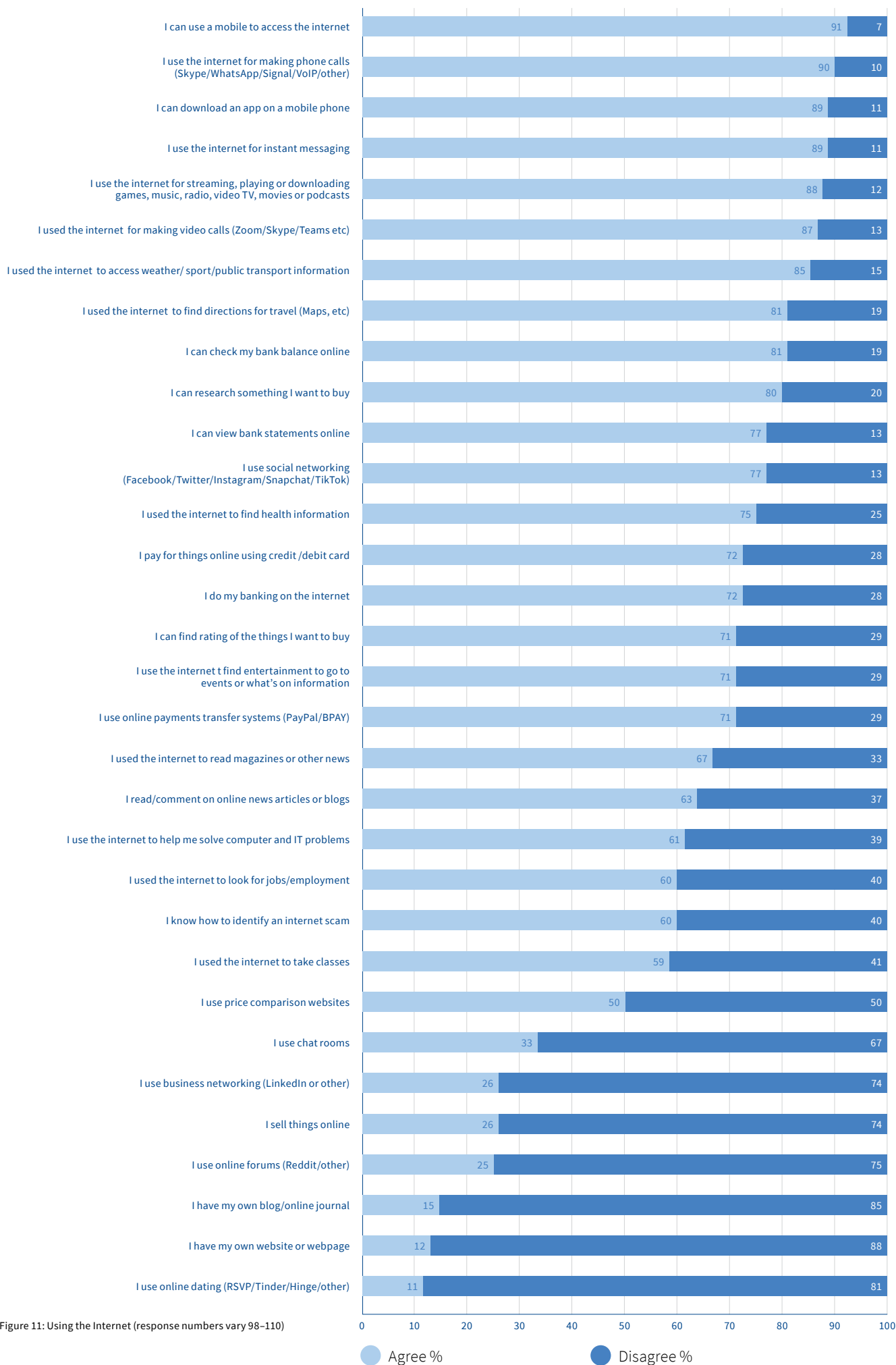
Figure 11: Using the Internet (response numbers vary 98–110)

	Agree %	Disagree %
I can use a mobile to access the internet	91	7
I use the internet for making phone calls (Skype/WhatsApp/Signal/VoIP/other)	90	10
I can download an app on a mobile phone	89	11
I use the internet for instant messaging	89	11
I use the internet for streaming, playing or downloading games, music, radio, video TV, movies or podcasts	88	12
I used the internet for making video calls (Zoom/Skype/Teams etc)	87	13
I used the internet to access weather/ sport/public transport information	85	15
I used the internet to find directions for travel (Maps, etc)	81	19
I can check my bank balance online	81	19
I can research something I want to buy	80	20
I can view bank statements online	77	13
I use social networking (Facebook/Twitter/Instagram/Snapchat/TikTok)	77	13
I used the internet to find health information	75	25
I pay for things online using credit /debit card	72	28
I do my banking on the internet	72	28
I can find rating of the things I want to buy	71	29
I use the internet t find entertainment to go to events or what's on information	71	29
I use online payments transfer systems (PayPal/BPAY)	71	29
I used the internet to read magazines or other news	67	33
I read/comment on online news articles or blogs	63	37
I use the internet to help me solve computer and IT problems	61	39
I used the internet to look for jobs/employment	60	40
I know how to identify an internet scam	60	40
I used the internet to take classes	59	41
I use price comparison websites	50	50
I use chat rooms	33	67
I use business networking (LinkedIn or other)	26	74
I sell things online	26	74
I use online forums (Reddit/other)	25	75
I have my own blog/online journal	15	85
I have my own website or webpage	12	88
I use online dating (RSVP/Tinder/Hinge/other)	11	81

Interestingly, three of the top six internet usage statements were about communication; video calling (87%), instant messaging (89%), and making phone calls (90%) were all reported as common ways that participants used the internet. However, 88% of our respondents also used the internet for entertainments such as streaming or gaming. Least common internet uses for people in this included online dating (11%), operating their own webpage (12%), or writing their own blog (15%). Interestingly, in Focus Group 5, two participants were playfully teased about their internet dating, with both (a male and a female) stating they were using it to meet people. The male participant went on unprompted to state that he used internet dating more than once a week. The female participant did not engage with further discussion, and we moved the conversation on, concerned that she was uncomfortable. This could indicate that people are less willing to report their use of this function of the internet.

As well as being asked about their attitudes and skills, participants were asked to select their changing technology usage during times of COVID-19 restrictions and lockdowns. This question asked participants to consider their pre-COVID-19 lockdown experiences as well as their experiences during COVID-19 lockdown. As can be seen below in Figure 12, most people had used the internet to connect with family both in Australia and overseas. However, there were still a consistent 10% of participants who had never used the internet—including during lockdown periods—to communicate with family, or indeed undertake any of the activities mentioned below such as attend school, seek advice, take part in social activities, and so on.

The most recent ADII report found that 'Australians who speak a language other than English at home are in general more digitally included than others' (2021, p. 7). Focus groups and interviews provided important insight into the relationships between language skills and digital access. We also found that for some people who speak limited English, the internet offered opportunities to access services, translate information into a preferred language, and engage in English classes. For example, this focus group participant explained:

Participant: *I used it [the internet] for the language here because I'm learning still the English and then the English and my language in Somalia translated. (Focus group 1)*

An interviewee explained that his limited skills in English meant that he was more proficient using devices that had adjustable operational language settings, and as a result he used a smartphone and iPad for online access:

Facilitator: *On the computer often the dominant language to navigate an iPad or a computer is English? Do you find that this is a challenge for learning how to use the computer?*

Interviewee: *[Interpreted] Yes. It's difficult. Very difficult for me.*

Interviewee: *[Interpreted] Luckily he can use his phone purely in Vietnamese, even the setup of the phone was already in Vietnamese. They provide setup, setting and he reads the newspaper or other things mostly in Vietnamese. (Interviewee 4)*
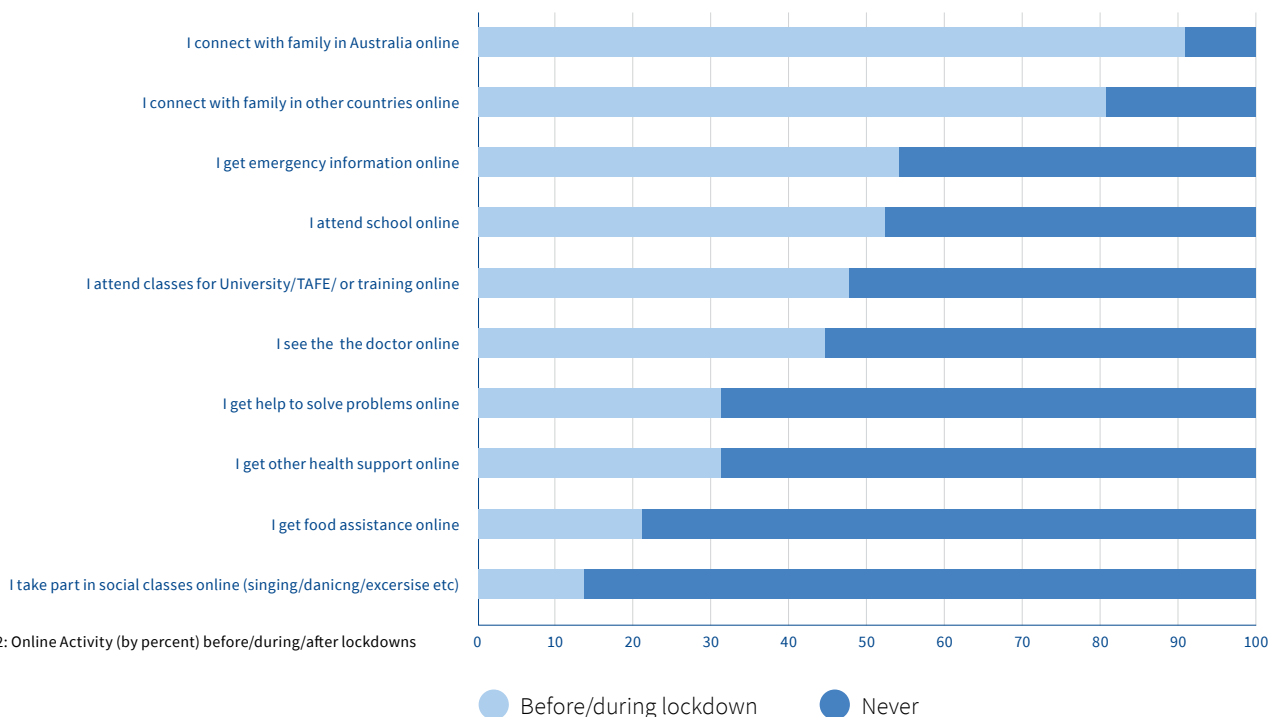

Figure 12: Online Activity (by percent) before/during/after lockdowns

At a time when mobile-only users are increasingly seen as lagging behind, and as their choices are predominantly explained through an affordability lens, insight into both the language and the digital skills that are required to operate different devices is lacking. This is especially important as it seems that device choices based on skill levels go on to influence people's device and connection expenditures.

It was evident that some research participants found the internet helpful for remediating shortfalls in language skills, and others found way around the dominance of English as an operational language in technologies. Conversely though, use of the internet for a large number of mostly elderly research participants with limited English was largely enacted through their children. The focus group with elderly Eritrean women was especially telling in this way. For example, these participants described how they relied on their children for online clothes shopping.

> *Participant: no, the children, my daughters do it for me, I have two daughter and one son.*

Facilitator: they shop online?

Participant *[interpreted]: they buy for her.*

Facilitator: ah okay and when we were in lockdown did you shop online then?

> *Participant: yes, my daughter yes.*

Participants: *[over-speaking] [some say yes and some no] [...]*

Facilitator: is it easier to get the clothes she wants online?

Participants *[interpreted]: other than their kids bringing things for them from online shopping they don't do that themselves. (Focus group 4)*

However, this does not mean that these research participants' skills shut them out of internet use completely. Rather, they seemed to have developed proficiency in a number of essential tasks and left other, less pressing tasks to younger members of the family. To illustrate, the women nearly unanimously reported that they use the internet to manage their Centrelink accounts:

Facilitator: and is it [accessing services such as Centrelink] easier than the phone?

Participants *[over-speaking, some in English, some in Arabic]: 'yes', 'on phone keep you waiting, hours', 'one hour', 'online is easy']*

Interpreter: so it's easier online than on the phone. (Focus group 4)

This use of the internet seemed motivated by the near impossibility to speak to service staff over the phone.

Participants who reflected on digital access barriers that they experienced due to English language and digital skill levels reported being unable to use their internet connection for prolonged periods after it was disrupted.

Facilitator: Okay, so then if you have a problem with the computer or anything like that, then your children come to the flat?

> *Interviewee: [Interpreted] Yes, that's correct.*

Interpreter: So they mostly rely on children or any trouble or problem with their internet. Sometimes, every year they experience the same disruption like a few days no internet, but children live too far away from them. One lives in Doncaster and the other one in Springvale and they're busy as well, therefore every time call them up and ask them to fix or find the problem, it's just they can't, yeah.

Facilitator: Oh, so...

Interpreter: If they came—children came and they trying to fix it—they could not fix it, they can call the service provider and report the problem, but they can't do that by themselves. (Interviewee 5)

We also encountered several people who were working through an administrative error who asked for help with those errors during the research process.

> *Interviewee: [Interpreted] A friend is usually using the internet to access Centrelink and [unclear] she did something wrong, it deleted maybe the page, now he wants to set again but he doesn't know how to do it, anything we can help.*

Facilitator: Okay. You're finding it hard. Did you use the phone or just the internet?

> *Interviewee: [Interpreted] He said, every two weeks had to ring up to report and now he's tried using the phone but can't set the phone.*

Facilitator: Okay. That is really frustrating then, the ability to kind of use that. Is that because the internet is bad or because the form is bad?

> *Interviewee: [Interpreted] They said they just, the page deleted and then it's now they want to set again but it might be difficult. (Interviewee 4)*

As above, this demonstrated that people who had limited digital skills were able to learn to perform essential online tasks. However, when that task became disrupted by a change in online forms, an update, or an unexpected error, the need for assistance delayed the resolution of problems. In sum, unreliability of internet connections and the changeability of online forms and services requires additional skills, and skills that are adaptable and transferable to changing online tasks.

Research participants had a strong preference for friends and family to help with any troubleshooting. When those personal networks were not available or not sufficient to tackle the challenge at hand, locally trusted community organisations, such as a learning centre, provided important supports to help people overcome such problems.

Facilitator: Do you have any trouble with your devices sometimes, like error messages or things like that?

Interviewee: [Interpreter] Yes.

Facilitator: Are there any people around that you can ask for help with those things?

Interviewee: [Interpreter] Mostly I rely on my own daughter.

Facilitator: Anyone else?

Interviewee: [Interpreter] If outside, then I ask my friends if they can help.

Facilitator: Okay, so your friends sometimes help, that's great. How about at The Learning Centre, do they offer help with these kinds of things?

Interviewee: [Interpreter] Yes, they provide. (Interviewee 6)

In addition to the digital skills required to shop online, access Centrelink accounts, or speak to friends, research participants drew attention to the importance of technical skills in a context where disruptions in connectivity were common.

Facilitator: Do you think that when you were working from home and the signal was bad, then you would use hotspot it from your phone, did you do that?

Interviewee: No. Unfortunately, at work we couldn't use hotspots, so we'd have to get the - like the internet, it would come back. I used to turn the modem off, turn it back on, do some troubleshooting like Optus taught me and then it would come back. Then I would contact them that night and be like, I can't do this, I need a more stable option, like you're going to have to help me rather than always troubleshooting it.

Facilitator: Yeah. What kind of troubleshooting did they teach you?

Interviewee: They told me I had to hold the reset button for 10 seconds, and then it resets the whole modem. Then when you do that, it will come back, like the signal will come back, but it was an inconvenience. (Interviewee 3)

This interviewee's process was similar to the diagnostic processes that residents developed in response to poor reliability and speeds discussed in the section on affordability. Diagnosing problems in a complex assemblage of modems, devices, and telecommunication providers' products required participants to develop technical skills that go far beyond the digital skills considered in the ADII report (2021).

People with technical expertise, such as call centre and installation staff, who have some control over residents' connectivity, were commonly experienced as unforthcoming. One resident with a failing internet connection told researchers that instead of calling her on her phone, telecommunications staff gave up when they encountered a broken intercom system at the bottom of the building. Another resident reported that her NBN modem was installed in a location in the home that was convenient to the installer but not conducive to securing a strong signal throughout the three-bedroom unit.

Facilitator: So when you kind of make sense of like - okay, this Wi-Fi is here. When you think about, what makes that? Is it just the distance or is it the walls in between, do you think, that are the problem?

Interviewee: I think it might be the distance because the Wi-Fi was not supposed to go here. I was planning on putting it here in my room, so it can be in the middle of the house. But it was a whole problem of getting it to the house and there was no electricity at the time. […] There was no electricity in the whole house. So I had to actually get a very long extension cord from my neighbour's house, who had electricity, to my house. It only reached to the kitchen. That was why we put the modem there. (Interviewee 2)

This interviewee recounted that the person who came to install her connection was unable and/or unwilling to install the modem in a location that would have afforded her a better signal. The time of installation appears as an important moment to reduce the need for troubleshooting later on, as the modem appeared to be fixed in place to participants once it had been installed.

This section has shown that participants develop the skills they need to respond to unreliable internet and unaccommodating digital platforms, or they find assistance from family, friends, and community sources. These findings also demonstrate that living in a poorly serviced residential location creates additional skill requirements for people to maintain their internet connections. Unreliable internet thus has myriad flow-on effects that create inequitable outcomes such as interrupted work, additional investments in time and money, and significantly reduced enjoyment compared to expenditure.

LIMITATIONS

This report provides some baseline evidence in support of building understanding of some of the factors associated with internet access and digital inequality. In future research, it would be essential to have reliable data on the use of the internet. To that end, future studies should focus on how individuals are using ICT to participate in society. When bridging gaps in the digital divide beyond access, policy makers must ensure solutions are tailored towards structures of wider socio-economic inequality, as highlighted in age, migrant status, and socioeconomic status. Expanding on the conceptualisation of the digital divide will also require data able to reflect other variables such as motivation to access, skills to actively use ICT, and opportunities (DiMaggio et al., 2004)

Additionally, while efforts to recruit participants were aided by the community researcher and assistant, there were other communities within the estate that are under-represented in this research. While we translated the surveys into ten languages, low literacy in participants' first language was identified by our community partners as a continuing barrier to access. Due to the rolling lockdowns in the housing estate, and the vulnerability of residents who were unvaccinated, recruitment and access was limited throughout the project, despite extending timeframes up to a year beyond the initially anticipated dates. Much of our survey data was therefore collected online, leaving us little access to those who were not connected digitally, socially, or to our partner organisations.

DISCUSSION

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Internet is an essential service, and if not a human right, is an 'enabler' of human rights. The provision of internet is analogous to public water provision, in that it provides an essential resource requiring the regulation of costs.

Like water, the internet is now an essential resource providing connection, information, services, and opportunity, and should be available to people at an affordable rate and in a reliable matter. Research has also shown that if we follow this analogy of internet as an essential service, we must conclude that too often, supply runs dry, or the water flows dirty. In our case study, in addition to high household expenditure on internet costs against household incomes, Carlton Housing Estate residents received highly unreliable internet connections. We have shown that this further affected the affordability of the internet, because people need to purchase data to fill the gaps. Furthermore, that unreliability places more pressure on people's digital skills and technical abilities, because they need to figure out how to make their connections work in their home and troubleshoot their way through interruptions.

Our survey data of the Carlton Housing Estate resident population indicates that some larger households did not have a device for each person, where other households with two or three members had a device to person ratio that exceeded the 1:1 ratio required for online education and employment. About 20% of participants were provided with equipment such as laptops, desktop computers, and tablets by their community organisations or their schools and in interviews and focus groups several of our participants noted that due to COVID-19 lockdowns they needed to purchase additional devices. While the COVID-19 situation stimulated this move towards a 1:1 ratio, the additional burden on data and bandwidth was significant and exacerbated existing service quality issues. Of the survey respondents, 63% indicated that they accessed the internet through a mixture of modem and mobile phone connection. When this was discussed in focus groups and interviews one of the reasons participants felt they needed both modem and phone access to the internet was the lack of reliability of their NBN internet connections. Most of the 25 residents who participated in the five focus groups had an NBN connection and of these NBN users many reported that their connection was unreliable. Research participants described that their NBN connection would frequently be too slow to engage in common activities such as streaming, conference calling, or emailing, sometimes at the cost of professional appearance and access to work.

Collectively, the survey, focus group and interview results indicate that access to reliable and sufficiently fast internet is not a mere matter of affordability, but also of uneven accessibility as public housing residents are offered a substandard service. Technological literacy (Freeman et al., 2020) provided some with spatial strategies to remain connected in their homes despite substandard internet service provision. Numerous participants reported that they adapted how and when they worked from home to ensure they had the best chance of experiencing an uninterrupted connection.

There is an assumption in the ADII measurement of access that mobile use is not the best way to access the internet, but the focus group and interviews demonstrated that consumers have a far more reliable experience using the internet over their phones. A significant majority (70%) of survey participants reported that technology is changing so fast that it is difficult to keep up with it, and only half indicated that they go out of their way to engage with new technology. However, over 90% of participants were able to use their smartphone to access the internet, demonstrating that mobile phones have become an important way for people to access the internet both within and outside the home. As the 5G network extends across Australia and prices for unlimited data plans continue to fall, the quality of access may improve for some users, however, in our case study, most people are paying for both NBN and mobile services.

The most recent ADII report found that 'Australians who speak a language other than English at home are in general more digitally included than others' (2021, p. 7). Precedent in other studies (see, for example, Creagh, 2014) demonstrates that viewing Australians who use another language than English at home as a homogenous group can be misleading and hide the experiences of marginalised groups such as people of refugee background, First Nations people, and other groups that experience compounded systemic disadvantage. We found that for some people who speak limited English, the internet offered opportunities to access services, translate information into a preferred language, and engage in English classes, while also keeping them connected to news and community from home. For some, dependable mobile data was essential to interacting with services as they relied on digital translators to make themselves understood. At a time when mobile-only users are increasingly seen as lagging behind, and as their choices are predominantly explained through an affordability lens, insight into both the language and the digital skills that are required to operate different devices is lacking. This is important especially as it seems that device choices based on skill levels go on to influence people's device and connection expenditures.
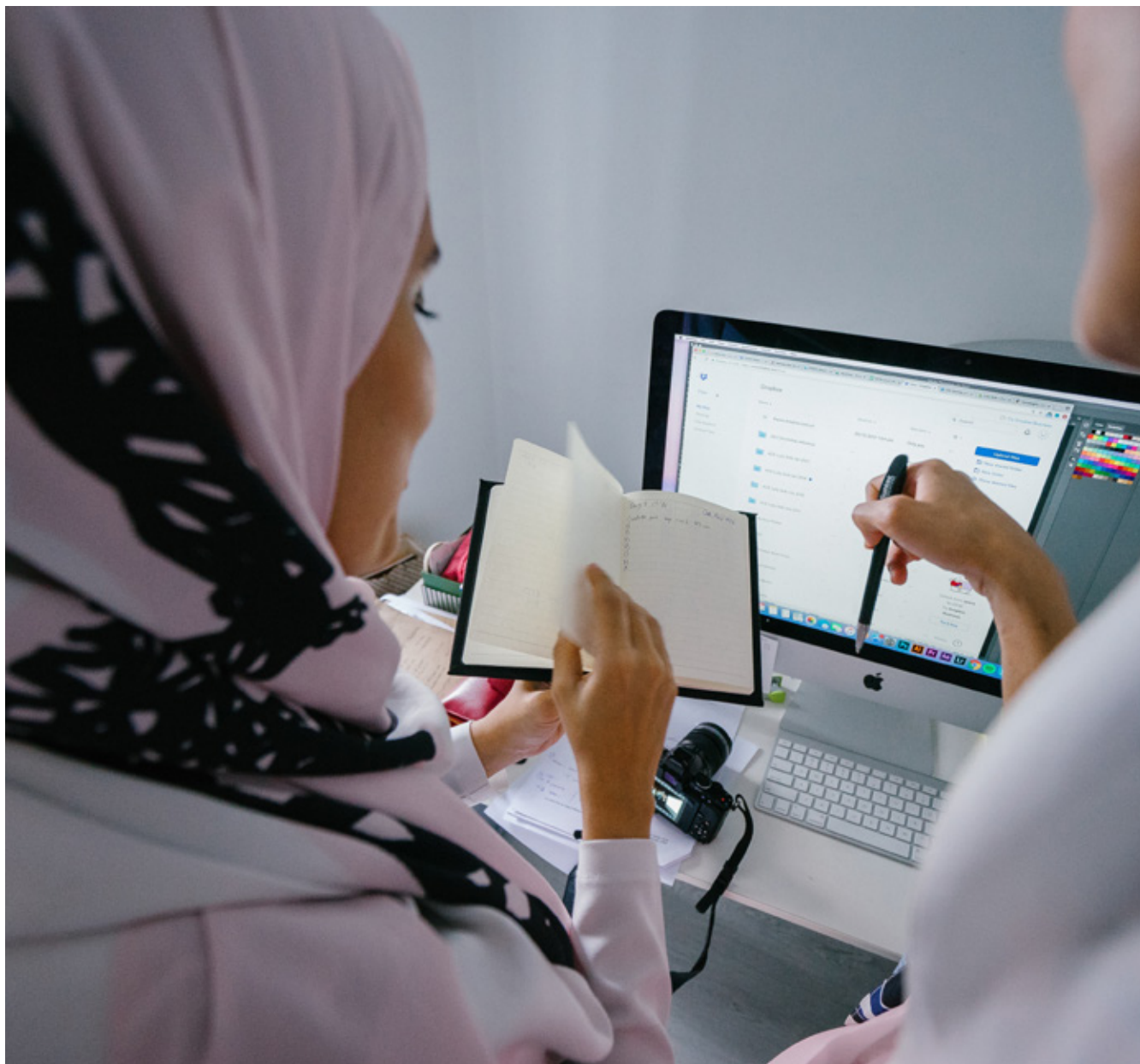
For many of our older participants with low levels of digital skills, this lack of skills did not shut them out of internet use completely. Rather, they seemed to have developed proficiency in a number of essential tasks and left other, less pressing tasks to younger members of the family. This leaves open the consideration of providing advice and resources to younger members of communities on how to support older people in learning to be more independent in these skills. This could also translate into more consumer awareness of the different reasons for unreliable internet, the different costs (and hidden costs) in connecting in different ways, and, most importantly, could provide communities with the understanding of their consumer rights with regards to internet service.

Additionally, people who were unemployed, underemployed, or had poor credit ratings were limited to the pre-paid market, and unable to access unlimited bundles. This resulted in higher ongoing cost for access to digital services for the very people who need the most support. Where people did have plans they often found themselves subject to small print conditions that led to high costs when they went over their data limits.

Our suggestions will only be effective, however, if regulation and legislation shift to measures of *quality* of internet access for citizens rather than just access. Wholesalers and retailers could be held to account through an independent regulator or Ombudsman who would gather feedback actively (rather than placing the impetus on consumers to report and make complaints), particularly in the communities which are already identified as being digitally excluded. Where market competition is encouraged, it is particularly important to keep consumer satisfaction and complaints reporting from vulnerable communities. Further privatising and opening competitive market conditions around the assets and infrastructure supporting the internet brings the risk that citizens who are already exposed to digital inaccessibility will continue to find themselves on the wrong side of the digital divide.

CONCLUSIONS

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Recent research on the digital divide takes an increasingly nuanced approach to issues of affordability and access, considering degrees of convenience and flow-on effects from the quality of devices that people can afford on strained household budgets (Lussier-Desrochers, 2017).

However, like the focus on first-level digital divide, the approach of most research overlooks the qualitative dimensions of access that interact with the uneven distribution of physical infrastructure. It also does little to unearth the everyday experiences, opportunities, and barriers of urban residents trying to access infrastructure or use digital technology, which might be related to wider structural inequalities and uneven opportunities due to requirements for social capital and skill.

When these themes were discussed in focus groups and interviews, one of the reasons participants felt they needed both modem and phone access to the internet was the lack of reliability of their NBN internet connections. The many different components that must work together to produce a reliable internet connection (a data plan with a particular provider, a phone or other device, a modem) obfuscate the diagnostic process and make it impossible for people to identify which component is making their internet lag.

Collectively, the survey, focus group and interview results indicate that access to reliable and sufficiently fast internet is not a mere matter of affordability, but also of uneven accessibility as public housing residents are offered a substandard service. They found the customer service inaccessible and unresponsive from to point of installation through to troubleshooting problems, and eventually found themselves paying more for a continued substandard service. This reportedly had flow on effects on access to education and employment and exacerbated their already disadvantaged circumstances.

RECOMMENDATIONS

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Everyone should be able to get low cost, good internet and that is why we recommend that priority must be given to the development of not-for-profit alternatives that can be rolled out in places such as public housing estates where many people stand to benefit from more cost-effective options.

Internet companies and governments need to set minimum quality standards to ensure that the internet works for everyone.

Internet companies and governments work together to create a product offering that provides low-cost options that do not force people to sacrifice quality or reliability.

Internet/NBN costs need to reflect that many people use mobile data when the NBN fails.

Governments, internet companies and social housing providers should speak to people who find it hard to access the internet because the involvement of housing providers can help make sure that the internet works better inside social housing estates.

Researchers must focus more on how people access the internet, not just on whether they access the internet or not and at what cost.

REFERENCES

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Alam, K., & Imran, S. (2015). The digital divide and social inclusion among refugee migrants: A case in regional Australia. *Information Technology & People*, *28*(2), 1–14.

Allen, A., Lambert, R., Apsan Frediani, A., & Ome, T. (2015). Can participatory mapping activate spatial and political practices? Mapping popular resistance and dwelling practices in Bogotá eastern hills. *Area*, *47*(3), 261–271.

Australian Bureau of Statistics (ABS). (2016). The 2016 Australia Census Community Profile. https://www.abs.gov.au/census/find-census-data/community-profiles/2016/0

Australian Communication Consumer Action Network (ACCAN). (2021). *Addressing telecommunications affordability: Evaluating support for low income consumers* (Final Report). ACCAN. https://accan.org.au/accans-work/research/1924-telco-affordability

Australian Communications and Media Authority (ACMA). (2020). *Trends in online behaviour and technology use.* Australian Government. https://www.acma.gov.au/sites/default/files/2020-09/Trends-in-online-behaviour0-and-technology-usage-ACMA-consumer-survey-2020.pdf

Australian Communications and Media Authority (ACMA). (2021). *Communication and Media in Australia. How we use the internet*. Australian Government. https://www.acma.gov.au/publications/2021-12/report/communications-and-media-australia-how-we-use-internet#:~:text=Nearly%20all%20Australian%20adults%20(99,prior%20to%20COVID%2D19%20lockdowns.

Australian Competition and Consumer Commission (ACCC). (2021a). *Digital advertising services inquiry* (Final Report, August 2021). Australian Government. https://www.accc.gov.au/system/files/Digital%20advertising%20services%20inquiry%20-%20final%20report.pdf

Australian Competition and Consumer Commission (ACCC) (2021b) *Digital Platform Services Inquiry Discussion Paper for Interim Report No 5: Updating competition and consumer law for digital platform services.* Submission to Office of Australian Information Commissioner's Digital Platform Services Inquiry. https://www.accc.gov.au/system/files/DBP%20-%20DPSI%20-%20September%202022%20report%20-%20Submission%20-%20Office%20of%20the%20Australian%20Information%20Commission%20-%20Public%20%281%29.pdf

Australian Competition and Consumer Commission (ACCC). (2022). *Measuring Broadband Australia*. Australian Government. https://www.accc.gov.au/consumers/internet-landline-services/broadband-performance-data

Australian Human Rights Commission (AHRC). (2016). *Human rights and the internet*. AHRC. https://humanrights.gov.au/our-work/rights-and-freedoms/projects/human-rights-and-internet

Barzilai-Nahon, K. (2006). Gaps and bits: Conceptualizing measurements for digital divide/s. *The Information Society, 22*(5), 269–278. https://doi.org/10.1080/01972240600903953

Black, E., Ferdig, R., & Thompson, L. A. (2021). K-12 virtual schooling, COVID-19, and student success. *JAMA Pediatrics, 175*(2), 119–120. https://doi.org/10.1001/jamapediatrics.2020.3800

Blazer, D. G., Hybels, C. F., & Pieper, C. F. (2001). The association of depression and mortality in elderly persons: A case for multiple, independent pathways. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 56*(8), 505–509.

Brickell, K. (2012). 'Mapping'and 'doing'critical geographies of home. *Progress in Human Geography*, *36*(2), 225–244.

Brown, N., Te Riele, K., Shelley, B. & Woodroffe, J. (2020). Learning at home during COVID-19: Effects on vulnerable young Australians. Independent Rapid Response Report. Hobart: University of Tasmania, Peter Underwood Centre for Educational Attainment. https://www.utas.edu.au/__data/assets/pdf_file/0008/1324268/Learning-at-home-during-COVID-19-updated.pdf

Büchi, M., Just, N., & Latzer, M. (2016). Modeling the second-level digital divide: A five-country study of social differences in Internet use. *New Media & Society, 18*(11), 2703–2722.

Burkett, I. (n.d.). *An introduction to co-design*. Knode. https://www.yacwa.org.au/wp-content/uploads/2016/09/An-Introduction-to-Co-Design-by-Ingrid-Burkett.pdf

Centre for Population. (2020). *Population Statement: Overview*. Australian Government. https://population.gov.au/docs/population_statement_2020_overview.pdf

Chetty, K., Qigui, L., Gcora, N., Josie, J., Wenwei, L., &Fang, C. (2018). Bridging the digital divide: measuring digital literacy. *Economics, 12*(1). https://doi.org/10.5018/economics-ejournal.ja.2018-23 .

Collins, C., Ruppanner, L., Christin Landivar, L., & Scarborough, W. J. (2021). The gendered consequences of a weak infrastructure of care: School reopening plans and parents' employment during the COVID-19 pandemic. *Gender & Society, 35*(2), 180–193.

Coyle, C. E., & Dugan, E. (2012). Social isolation, loneliness and health among older adults. *Journal of Aging and Health, 24*(8), 1346–1363.

Creagh, S. (2014). A critical analysis of problems with the LBOTE category on the NAPLaN test. *Australian Educational Researcher*, 41(1), 1–23. https://search.informit.org/doi/10.3316/aeipt.206158

CRPC 2021, The Digital Checkout. Consumer Policy Research Centre. https://cprc.org.au/the-digital-checkout/

DiMaggio, P., Hargittai, E., Celeste, C., & Shafer, S. (2004). Digital inequality: From unequal access to differentiated use. In K. Neckerman (Ed.), *Social Inequality* (pp. 355–400). Russell Sage Foundation.

Drane, C.F., Vernon, L. & O'Shea, S. Vulnerable learners in the age of COVID-19: A scoping review. Australian Educational Reearcher. 48, 585–604 (2021). https://doi.org/10.1007/s13384-020-00409-5

Economist Intelligence Unit. (2018) The Inclusive Internet Index. https://theinclusiveinterrnetindex.eiu.com

Elena-Bucea, A., Cruz-Jesus, F., Oliveira, T., & Coelho, P. S. (2020). Assessing the role of age, education, gender and income on the digital divide: Evidence for the European Union. *Information Systems Frontiers*, 23(4), 1–15.

Ellcessor, E. (2016). *Restricted access: Media, disability, and the politics of participation*. New York University Press.

Erdiaw-Kwasie, M.O., & Alam, K. (2016). Towards understanding digital divide in rural partnerships and development: A framework and evidence from rural Australia. *Journal of Rural Studies, 43*, 214–224.

Freeman, J., Park, S., & Middleton, C. (2020). Technological literacy and interrupted internet access. *Information, Communication & Society, 23*(13), 1947–1964.

Gerli, P., & Whalley, J. (2018, August 1–4). *Fibre to the countryside: A comparison of public and community initiatives in the UK* [Conference paper]. 29th European Regional Conference of the International Telecommunications Society (ITS): Towards a digital future: Turning technology into markets? Trento. https://doi.org/10.2139/ssrn.3137164

Gerli, P., Van der Wee, M., Verbrugge, S., & Whalley, J. (2018). The involvement of utilities in the development of broadband infrastructure: A comparison of EU case studies. *Telecommunications Polic,y 42*, 726–743.

Giansanti, D., & Veltro, G. (2021). The *Digital Divide* in the era of COVID-19: An investigation into an important obstacle to the access to the *mHealth* by the citizen. *Healthcare, 9*(4), 371. https://doi.org/10.3390/healthcare9040371

Goedhart, N. S., Broerse, J. E., Kattouw, R., & Dedding, C. (2019). 'Just having a computer doesn't make sense': The digital divide from the perspective of mothers with a low socio-economic position. *New Media & Society, 21*(11–12), 2347–2365.

Good Things Foundation Australia. (2021). *Digital Nation Australia 2021*. Good Things Foundation Australia. https://www.goodthingsfoundation.org.au/news/digital-nation-australia-2021/

Gray, J., Gerlitz, C., & Bounegru, L. (2018). Data infrastructure literacy. Big Data & Society. https://doi.org/10.1177/2053951718786316

Halford, S., & Savage, M. (2010). Reconceptualizing Digital Social Inequality. *Information, Communication & Society, 13*(7), 937–955. https://doi.org/10.1080/1369118X.2010.499956

Hassani, S. N. (2006). Locating digital divides at home, work, and everywhere else. *Poetics, 34*(4–5), 250–272.

Hinton, T. (2021). *Annual growth in online retail spending in Australia as of June 2020, by category*. Statista. https://www.statista.com/statistics/694330/australia-online-spending-annual-growth-by-category/

Houghton, J. (2020). *Communicating about COVID-19: Health literacy and language services during the pandemic.* Ethnic Communities Council of Victoria. https://eccv.org.au/wp-content/uploads/2020/10/ECCV-Policy-Paper_Communicating-About-COVID19_October2020.pdf

Human Rights Commission (HRC). (2011). *Report of the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression, Frank La Rue*. HRC. https://www2.ohchr.org/english/bodies/hrcouncil/docs/17session/a.hrc.17.27_en.pdf

Kralj, A. J., Cooper, M., & Wright, S. E. (2020). *Communicating with migrant and refugee communities during COVID-19: Learnings for the future*. Settlement Council of Australia. http://scoa.org.au/wp-content/uploads/2020/11/Report-Communications-during-COVID-19-FINAL.pdf

Literat, I. (2013). Participatory mapping with urban youth: The visual elicitation of socio-spatial research data. *Learning, Media and Technology, 38*(2), 198–216, https://doi.org:10.1080/17439884.2013.782037

Lloyd, A., Kennan, M. A., Thompson, K. M., & Qayyum, A. (2013). Connecting with new information landscapes: Information literacy practices of refugees. *Journal of Documentation, 69*(1), 121–144.

Lussier-Desrochers, D., Normand, C. L., Romero-Torres, A., Lachapelle, Y., Godin-Tremblay, V., Dupont, M. È., Roux, J., Pépin-Beauchesne, L., & Bilodeau, P. (2017). Bridging the digital divide for people with intellectual disability. *Cyberpsychology*, *11*(1).

Marshall, A., Dezuanni, M., Burgess, J., Thomas, J., & Wilson, C. K. (2020) Australian farmers left behind in the digital economy: Insights from the Australian Digital Inclusion Index. *Journal of Rural Studies, 80*, 195–210.

Martins Van Jaarsveld, G. (2020). The effects of COVID-19 among the elderly population: a case for closing the digital divide. Frontiers in psychiatry, 1211.

Morrow, B. (2018). *Shrinking the digital divide.* NBNco. https://www.nbnco.com.au/blog/the-nbn-project/shrinking-the-digital-divide

Moskal, M. (2015). 'When I think home I think family here and there': Translocal and social ideas of home in narratives of migrant children and young people. *Geoforum, 58,* 143–152

National Seniors Productive Ageing Centre (NSPAC). (2011). *Older Australians and the Internet: Bridging the Digital Divide*. Australian Department of Health and Aging. https://www.aph.gov.au/parliamentary_business/committees/house_of_representatives_committees?url=jscc/senior_australians/subs/sub29.pdf

Neves, B. B., Amaro, F., & Fonseca, J. R. (2013). Coming of (old) age in the digital age: ICT usage and non-usage among older adults. *Sociological Research Online, 18*(2), 22–35.

Nguyen, A., Mosadeghi, S., & Almario, C. V., 2017. Persistent digital divide in access to and use of the Internet as a resource for health information: Results from a California population-based study. *International Journal of Medical Informatics, 103*, 49–54.

Ogle, G. & Musolino, V. (2016). *Connectivity costs: Telecommunications affordability for low income Australians.* Australian Communication Consumer Action Network (ACCAN). https://accan.org.au/files/Reports/161011_Connectivity%20Costs_accessible-web.pdf

Organisation for Economic Cooperation and Development (OECD). (2020). Learning remotely when schools close. https://www.oecd.org/coronavirus/policy-responses/learning-remotely-when-schools-close-how-well-are-students-and-schools-prepared-insights-from-pisa-3bfda1f7/

Philip, L., & Williams, F. (2019). Remote rural home based businesses and digital inequalities: Understanding needs and expectations in a digitally underserved community. *Journal of Rural Studies*, *68,* 306–318.

Powell, A., Bryne, A., & Dailey, D. (2010). The essential internet: Digital exclusion in low⬚income American communities. *Policy & Internet, 2*(2), 161–192.

PricewaterhouseCoopers (PwC). (2021). The life-changing potential of digita inclusion understanding digital barriers – and how we can work together to address them https://www.pwc.com.au/consulting/connected-government/pwc-the-life-changing-potential-of-digital-inclusion.pdf

Roy Morgan (2020). *Nearly a third of Australian workers have been '#WFH'*. Roy Morgan. http://www.roymorgan.com/findings/8451-roy-morgan-working-from-home-june-2020-202006290638

Safarov, N. (2021). Personal experiences of digital public services access and use: Older migrants' digital choices. *Technology in Society, 66*, 101627.

Schou, J. & Pors, A. S. (2019). Digital by default? A qualitative study of exclusion in digitalised welfare. *Social Policy and Administration*, *53*(3), 464–477.

Smith, C., Tani, M. Yates, S. & Dickinson, H. (2022). Successful school interventions for students with disability during Covid-19: Empirical evidence from Australia. *The Asia-Pacific Education Researcher*. https://doi.org/10.1007/s40299-022-00659-0

Sourbati, M. (2012). Disabling communications? A capabilities perspective on media access, social inclusion and communication policy. *Media, Culture and Society*, *34*(5), 571–587.

Swords, J., Jeffries, M., East, H., & Messer, S. (2019). Mapping the city: Participatory mapping with young people. *Geography, 104*(3), 141–147.

Thomas, J., Barraket, J., Wilson, C. K., Rennie, E., Ewing, S., & MacDonald, T. (2019). *Measuring Australia's Digital Divide: The Australian Digital Inclusion Index 2019*. RMIT University and Swinburne University of Technology, Melbourne, for Telstra.

Thomas, J., Barraket, J., Wilson, CK., Holcombe-James, I., Kennedy, J., Rennie, E., Ewing, S., & MacDonald, T. (2020). *Measuring Australia's Digital Divide: The Australian Digital Inclusion Index 2020*. RMIT and Swinburne University of Technology, Melbourne, for Telstra. https://doi.org/10.25916/5f6eb9949c832

Thomas, J., Barraket, J., Parkinson, S., Wilson, C., Holcombe-James, I., Kennedy, J., Mannell, K., & Brydon, A. (2021). *Australian Digital Inclusion Index: 2021*. Melbourne: RMIT, Swinburne University of Technology, and Telstra. https://doi.org:10.25916/phgw-b725

Townsend, L., Wallace, C., & Fairhurst, G. (2015). 'Stuck out here': The critical role of broadband for remote rural places. *Scottish Geographical Journal, 131*(3-4), 171–180.

Underwood, J. (2007). Rethinking the digital divide: Impacts on student tutor relationships. *European Journal of Education, 42*(2), 213–222.

United Nations. (2014). *E-Government Survey 2014: E-Government for the Future We Want*. United Nations. https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2014-Survey/E-Gov_Complete_Survey-2014.pdf

Van Deursen, A. J. & Helsper, E. J. (2015). The third-level digital divide: Who benefits most from being online? *Communication and Information Technologies Annual, 10*, 29–53.

Warschauer, M. (2004). *Technology and social inclusion: Rethinking the digital divide*. MIT Press.

Watling, S., & Crawford, K. (2010). Digital Exclusion: Implications for Human Services Practitioners. *Journal of Technology in Human Services*, *28*(4), 205–216.

Wilson, K., Coen, S. E., Piaskoski, A., & Gilliland, J. A. (2019). Children's perspectives on neighbourhood barriers and enablers to active school travel: a participatory mapping study. *The Canadian Geographer/Le Géographe canadien*, *63*(1), 112–128.

Jembre Y. Z., Jung W-y., Attique M., Paul R., & Kim B. (2022). Mobile Broadband Performance Evaluation: Analysis of National Reports. *Electronics, 11*(3), 485. https://doi.org/10.3390/electronics11030485

Zhang, T., Gao, L., He, C., Zhang, M., Krishnamachari, B., & Avestimehr, A. S. (2022). Federated Learning for the Internet of Things: Applications, Challenges, and Opportunities. IEEE Internet of Things Magazine, 5(1), 24-29.

ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACCAN	Australian Communications Consumer Action Network
ACMA	Australian Communications and Media Authority
ADII	Australian Digital Inclusion Index
AHRC	Australian Human Rights Commission
CADI	Combined Agencies for Digital Inclusion
CRPC	Consumer Research Policy Centre
DoCA	Australian Government Department of Communications and the Arts
DSL	Digital Subscriber Line, a broadband technology typically used by telecommunications companies to access customers
LAN	Local Area Network, for computer-based networks generally in a premises
MNO	Mobile Network Operators
NBN	National Broadband Network
NHVic	Neighbourhood Houses Victoria
NMLL	North Melbourne Language Learning
NSPAC	National Seniors Productive Ageing Centre
OECD	Organisation for Economic Cooperation and Development
PwC	PricewaterhouseCoopers

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