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NEW ZEALAND INSTITUTE OF ECONOMIC RESEARCH

Addressing the digital divide:

The economic case for increasing digital inclusion

NZIER report to the Digital Council for Aotearoa

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NZIER was established in 1958.

Authorship

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Disclaimer

Access to the data used in this study was provided by Stats NZ under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the author, not Stats NZ or individual data suppliers. The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the Tax Administration Act 1994 for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

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Executive summary

We live in a world where our work and lives are increasingly digital – but we are not all experiencing the benefits

Technological progress has accelerated over the past decades, changing the lives of those who can access and use digital and data technologies. These technologies give us immediate real-time information, help us stay connected and provide opportunities to learn new skills. These benefits span our work, finances, home, community and social lives.

But not everyone is digitally included, and as many people's daily lives are increasingly transformed through digital technologies, those who are 'under-included'[1] are increasingly left behind. The impacts of this digital under-inclusion are not only significant for New Zealand's society and economy but are particularly acute for those people and communities most affected.

Digital under-inclusion is both a function of, and contributor to, social and economic exclusion by reducing access to services, social and community connections, education and work. Those with internet access tend to have higher wellbeing and richer social capital outcomes (for example, voting) than those without access (Grimes and White 2019).

In Aotearoa New Zealand, those more likely to be affected by digital under-inclusion due to not having internet in the home fall largely into two groups. The first group, those in single-person households without internet, are more likely to be older and New Zealand European and have roughly the same income as their counterparts with home internet. The second group, those in multi-person households without the internet, are more likely to be Pacific peoples or Māori in crowded households (which frequently include children) and have lower income.

Other (in some cases, overlapping) groups that are at risk of digital under-inclusion include disabled people, people living in social housing and those with low housing stability, migrants and refugees with English as a second language, people living in rural locations, unemployed people and those not actively seeking work.

This research helps us understand how we might approach investing in digital inclusion in New Zealand

The Digital Council for Aotearoa New Zealand commissioned NZIER to explore the rationale for government investment in digital inclusion.

This research increases our understanding of the benefits of digital inclusion in New Zealand, identifies the characteristics of promising interventions and provides insights into how we might value the benefits of investment in digital inclusion.

The research findings are based on a review of relevant literature (sections 3 and 4), an analysis of data sources available through Stats NZ's Integrated Data Infrastructure (IDI)

[1] For the purposes of this research report, we consider someone to be digitally included if they have the capability, opportunity and motivation to use the internet to pursue and realise meaningful social and economic outcomes. We use 'digital under-inclusion' to describe a person who does not have all of these conditions fulfilled and therefore cannot realise meaningful outcomes. See sections 1.2 and A.2 for more detail.

(section 3.1), a survey designed to better understand how New Zealanders value access to the internet (section 3.3) and a cost-benefit analysis to assess potential intervention scenarios (section 5).

This research benefited from engagement with Māori, but while we have considered New Zealand's unique context throughout, particularly regarding co-design, the research practices, tools and analytical approaches adopted are predominantly Western.

What we found

There is a strong case for government investment in digital inclusion …

Digital inclusion is essential for social inclusion and participation and provides significant benefits to people, whānau, communities and society. Ultimately, digital inclusion is an investment in social inclusion, equity and intergenerational wellbeing. Digital inclusion has benefits for the whole economy through higher employment, higher tax revenue, accelerating productivity and innovation, and gross domestic product (GDP) growth.

The case for investment in digital inclusion is convincing not just because failing to invest will increase inequality and exclusion but because the return on investment (ROI) in digital inclusion is likely to be significant. Our analysis of possible intervention scenarios found that potential ROI ranged from 1:2 to 1:3.

… but realising this investment depends on the choices government makes, and the greatest returns depend on community engagement and co-design

This research shows that providing internet, devices and skills training can increase digital inclusion. But the real gains emerge when community engagement and co-design are integrated into interventions. These types of interventions are likely to reach more people with longer-lasting effects and at a similar cost.

It is tempting to want to look forward and focus on investing in digital economic transformation through supporting businesses and providing advanced digital skills training. However, this research argues that growing digital inclusion is an essential foundation for economic transformation. Investing in the latter without placing equivalent or greater focus on the former risks deepening the digital divide, negatively affecting the excluded and broader societal wellbeing and limiting economic benefits.

Summary of findings

Digital inclusion in Aotearoa is unequally distributed

People without internet access are likely to experience other disadvantages
These disadvantages both contribute to and compound their levels of digital under-inclusion.

Some population groups are less likely to have access to the internet at home
The data shows that people without home internet largely fall into two groups. Those in single-person households without internet are more likely to be older and New Zealand European and have roughly the same income as their counterparts with home internet.

Those in multi-person households without the internet are more likely to be Pacific peoples or Māori in crowded households and have lower income.

The untapped benefits for Pacific peoples, Māori and low-income households are significant – particularly for rangatahi

Nearly a quarter of Pacific peoples are without the internet in the home – three times the rate for New Zealand Europeans and almost twice the rate for Māori. Māori and Pacific peoples are particularly over-represented amongst younger people without internet access. This suggests there is untapped potential for these groups of young people to see increased earnings and employment benefits over a lifetime.

Multi-person households without internet access are a good place to start

The number of older people in single-person households without internet is likely to naturally reduce over time (Grimes and White 2019), and those with and without internet at older ages have similar incomes, suggesting motivation as a key driver in their different internet use. Multi-person households without the internet (which are more likely to be households identifying as Pacific peoples or Māori, contain children, be considered crowded households and have lower household incomes) are therefore a clear place to start for increasing digital inclusion. The lifetime benefits that can be gleaned from access to the internet from an earlier age indicate that starting here has greater marginal benefits and the potential to help address intergenerational inequity.

Closing the digital divide can unlock the economic benefits of digital transformation in Aotearoa

Integrating and aligning efforts to increase digital inclusion with plans for digital transformation is more likely to result in a digital future that brings value to everyone compared to disconnected efforts to increase digital inclusion and transform our digital economy. If digital transformation is a policy objective, plans to grow the digital technologies sector risk increasing the digital divide if digital inclusion is not addressed either in advance or in parallel.

Digital inclusion brings numerous benefits

Digital inclusion brings financial and social benefits

Digital inclusion can bring a broad range of financial and social benefits to people, communities and society. It can have a positive impact on people's earnings and employability as well as reducing loneliness, helping people and communities stay connected, broadening horizons through information and education and opening doors to new opportunities.

Digital inclusion contributes to social inclusion, wellbeing and the economy

Since digital inclusion affects access to information, government services, recreation activities and social engagement, digital inequality can contribute to inequality in social inclusion and wellbeing. Those with internet access tend to have higher wellbeing and richer social capital outcomes (for example, voting) than those without access (Grimes and White 2019).

Digital inclusion has benefits for the whole economy through GDP growth, employment and productivity. Evidence from the United Kingdom (UK) suggests that the benefits to businesses of employees gaining basic digital skills was worth £1.5 billion over 10 years. In

New Zealand, researchers found an increase of 7–10% in firm productivity from adoption of broadband by the firm (Grimes, Ren and Stevens 2009).

The COVID-19 pandemic has highlighted the importance of digital inclusion
The COVID-19 pandemic has seen digital access and skills recognised as critical resources, with stark differences in quality of life for those with and without. The ability to be online provided an essential link to work, school, friends and family for people in lockdown. Health consultations, court appearances and major events all saw new ways of operating through the internet during lockdowns. Digital news also provided a major source of crucial information, sharing the latest rules, updates, locations of interest and where to find support. Many of these changes have become part of the new normal, including many workplaces moving towards permanent hybrid ways of working.

Digitally included New Zealanders place a high value on online services
Digitally included New Zealanders access many online services at no additional cost (for example, access to social media and online videos). We surveyed New Zealanders to uncover the value of these hidden benefits of internet access. The survey was designed to understand how much financial compensation people would need to give up a variety of popular online services, using a series of trade-off questions in which the participant selected a preference in a hypothetical situation. For example, they may have chosen between a year without access to online maps and receiving $1,000 or keeping access to online maps and receiving no money.

We found participants needed $1,700–3,500 to give up specific online services for 1 year. With a median individual weekly income of $1,093 in 2021, this means participants valued these services as being worth 2–3 weeks of median income per year (Stats NZ 2021a).

Key characteristics of successful digital inclusion interventions

Despite limited robust evidence for what works in digital inclusion interventions internationally and here in Aotearoa, we identified the following key themes:

- **Interventions are most effective when access to devices is combined with digital skills and technical support.** Currently, many interventions focus on providing access to devices and internet connections. However, ongoing access to technical support and digital skills training is also important.
- **Strategic oversight with consistent standards, outcomes and goals is important.** However, approaches to digital inclusion interventions, both in New Zealand and internationally, are fragmented with little agreement or consistency on standards, outcomes and goals across regions and organisations. Due to budget or time limits, the impact of interventions is often left unmeasured.
- **Interventions led by communities' needs and aspirations are more successful.** These co-designed interventions tend to include community leaders in the intervention design and implementation, which reflects communities' needs and aspirations. This characteristic has particular resonance in the Aotearoa New Zealand context, underlining the need to strengthen the Crown-Māori relationship and engage in co-design with Māori as well as with other community groups.
- **Organisations leading or facilitating digital inclusion interventions that are trusted by communities are more successful**. Organisations delivering effective interventions tend to be connected to wider social and economic support networks. This is

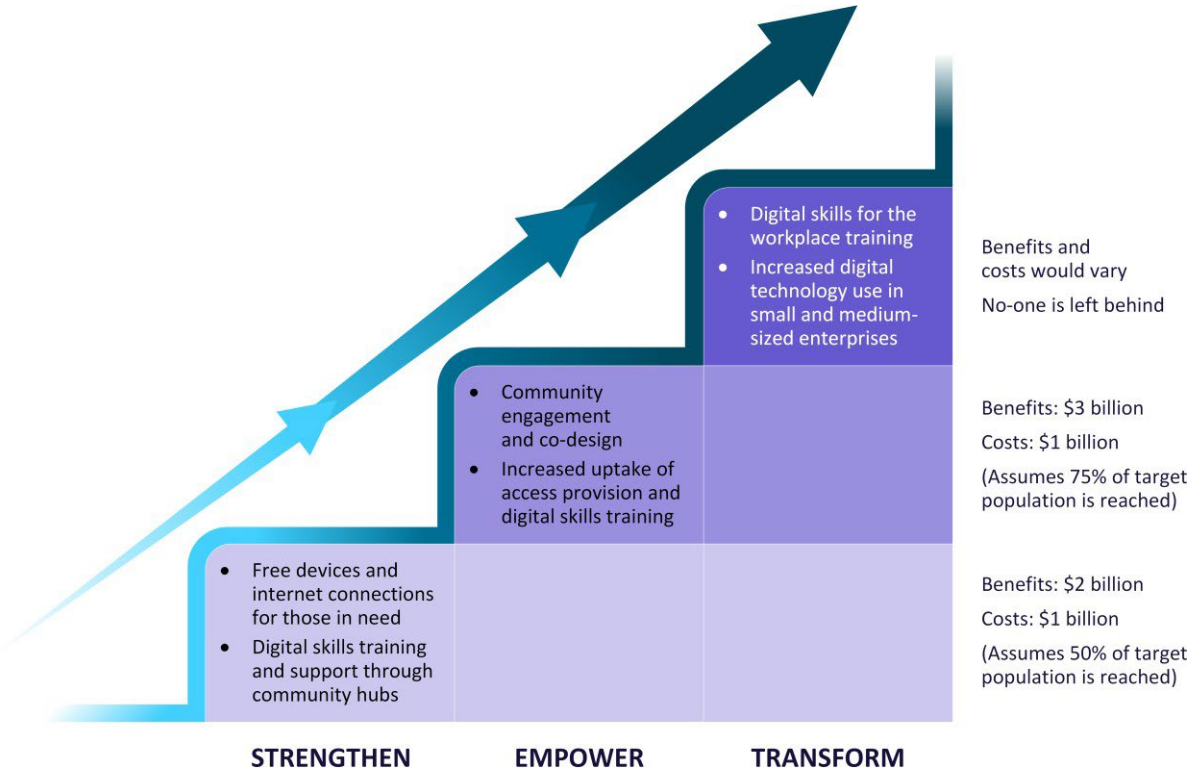
important because digital under-inclusion often occurs with other specific needs. Co-location of physical community digital hubs with other social service organisations provides the opportunity for more-holistic support, including cross-referral.

- **Community centres that provide non-digital ways to access services continue to be essential.** These centres can provide the most support if they have devices and internet access for public use and provide non-digital ways to access services, including in-person assistance. However, they do not necessarily address the digital accessibility needs of disabled people, who may benefit more from access to specialist equipment – again highlighting the importance of co-design with communities to ensure solutions meet their needs.

Approaches to investment in increasing digital inclusion

We considered how our findings could inform an approach to investment to increase digital inclusion in New Zealand over the medium term through the analysis of three possible intervention scenarios. These scenarios are summarised in Figure 1.

Figure 1 Three scenarios to increase digital inclusion



Source: NZIER

When we compared an intervention scenario that focused on device, connections and skills training only with a scenario that also incorporated community engagement and co-design, we found a significant potential increase in the ROI – from 1:2 to 1:3.

This means that, for the same level of investment, we could expect to see an increase in return – or net benefits – of approximately 100%. This makes a convincing argument for

investment in interventions that provide free devices, connections and skills training but do so through engagement and co-design with the communities they are intended to serve.

We also considered the current focus on business, economic and government transformation. We wanted to provide some insights into how successful these efforts might be without investment in increasing digital inclusion.

National digital transformation programmes that boost digital skills through advanced training for innovation and productivity can bring benefits to people and the economy, but without integrating digital inclusion and digital transformation efforts, we see a risk of widening the digital divide. Those who are already digitally included will become more so, while those who are not will fall increasingly further behind. Growing digital inclusion is therefore an essential foundation for economic transformation.

Better data and evaluation are essential

In New Zealand, our national data collection, monitoring and evaluation of digital inclusion metrics is not yet fit for purpose, and we need better data on digital inclusion, indicator monitoring and evidence on the effectiveness of interventions. We identified a need for meaningful metrics, going beyond internet in the home to understanding digital skills, confidence using them and trust in online environments as well as understanding the scale of online harms.

These metrics must also keep pace with change, as digital inclusion is not a stable state. Continuing technological innovation, upgrades of infrastructure and hardware and continual learning and accessibility requirements will contribute to new waves of digital under-inclusion (Ei, Soon and Tan 2021).

Any investment in digital inclusion should provide for ongoing evaluation with pre-determined research questions, data collection and the flexibility to adjust if the intervention is ineffective. We anticipate that a combination of qualitative evaluation, focused on user experience and perspectives, as well as quantitative, capturing the impact on measurable outcomes, will provide the most comprehensive and clear story of the intervention effectiveness.

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Glossary

Co-design	A design approach that actively involves users and stakeholders through some or all of the entire process
GDP	Gross domestic product
Hapū	Kinship group
Hui	Meeting
IDI	Integrated Data Infrastructure
Kaupapa	Project, topic, policy, or initiative
Korowai	Cloak
Mana motuhake	Self-determination
Marae	Courtyard of a meeting house where formal greetings and discussions take place
Mokopuna	Grandchildren
Rangatahi	Young people
Tangihanga	Funeral rituals
Whakapapa	Genealogy, historical context
Whānau	Family
WTA	Willingness to accept
WTP	Willingness to pay

1 Introduction

1.1 Towards an economic value of digital inclusion

In this report, we consolidate and expand on what we know about the nature of digital inclusion in Aotearoa New Zealand. We identify the benefits of increased digital inclusion as well as the key characteristics of promising interventions to address digital under-inclusion. We also explore a continuum of potential investment, identifying three intervention scenarios and, where possible, assessing their costs and benefits.

1.2 What is digital inclusion?

Throughout this report, we use the terms 'digital inclusion' and 'digital under-inclusion'. We consider someone to be digitally included if they have the capability, opportunity and motivation to use the internet to pursue and realise meaningful social and economic outcomes. Within these categories, we consider motivation, access, skills and trust, alongside other barriers, and the interactions between them.

We use 'digital under-inclusion' to describe a person who does not have all of these conditions fulfilled and therefore cannot realise meaningful outcomes. In this definition, we recognise that digital inclusion is not a binary condition but a spectrum. Absolute digital exclusion, where a person is completely excluded from the internet, is at the far end of under-inclusion and is not the exclusive focus of this report.

There are many legitimate reasons why some people choose to live their lives without the internet. We do not consider someone to be under-included who is able to use the internet but chooses not to if this choice is the only barrier and is not the result of fear or mistrust.

We provide background and expand on these definitions in section A.2.

1.3 Why does digital inclusion matter?

Technological progress has advanced rapidly over the past 20 years, changing the lives of those who can access and use technology. Digital devices give us immediate real-time information, help us stay connected and provide opportunities to learn new skills. These benefits span our work, finances, home, community and social lives.

Businesses and government services increasingly seek to reap the benefits of moving services online. These benefits include reduced transaction times, automation and cost savings through fewer physical premises. One example of this is the decline in bank branches, which have reduced by a quarter since 2019 (Stock 2021).

As it becomes increasingly difficult to fully participate in society without the internet, some are left behind. This movement to online services has major consequences for those without or with limited internet access. The digital divide contributes to the perpetuation of income and wellbeing inequality, as access to digital services can increase access to employment opportunities, banking and online learning. Aside from the direct wellbeing effects, there is strong evidence of the collective harms of inequality, which leads to weaker economic performance and reduces resilience to shocks (Ostry, Loungani and Berg 2019). We discuss the individual and collective benefits in section 3.

Internet access offers many opportunities, but entering digital environments brings its own challenges and risks. Issues of data security, online crime and the poor mental health effects of social media are all factors to navigate in the drive to get more people and services online. We explore these potential harms from the internet in section 3.4.

1.4 Te ao Māori and digital inclusion

Kaupapa Māori research considers digital technology and digital inclusion in the context of social, cultural, economic and environmental spheres. In the discussion paper *Pūmau Tonu te Mauri: Living as Māori, now and in the future*, Sir Mason Durie discusses how the connections between cultural elements form the culture as a whole, creating a korowai that enables the separate components to flourish. A solid cultural foundation supports wellness where the whole person is "able to stand tall, engage with others, look to the future and contribute to society" (Durie 2017, 19). Durie observed that digital connections open up avenues for participation on the marae, noting that online attendance at tangihanga was emerging and other hui were held online so whānau overseas could attend. Since 2020, the COVID-19 lockdowns forced these significant cultural events online, providing Māori an essential, albeit imperfect, connection to whānau, hapū and marae encounters (Dawes et al. 2021).

To understand the context of digital inclusion in te ao Māori, we must understand the role that digital inclusion plays across our social, cultural, economic and environmental spheres. We can use well-established Māori health models to understand this. Research with Māori participants undertaken by the Department of Internal Affairs (DIA 2020b) provided the recommendation that Durie's Te Whare Tapa Whā model be used as it complements the framing of digital inclusion and can help government to think holistically about wellbeing and mental health in the digital world. Originally developed for understanding Māori health, Te Whare Tapa Whā takes the shape of the wharenui to illustrate the four dimensions of Māori wellbeing – taha tinana (physical health), taha wairua (spiritual health), taha whānau (family health) and taha hinengaro (mental health) – and holds the caveat that, should one of the four dimensions be missing or damaged, a person or a collective may become unbalanced and subsequently unwell.

Durie later developed Te Pae Māhutonga, which brings together additional elements – mauri ora (cultural identity), waiora (physical environment), toiora (healthy lifestyles) and te oranga (participation in society). These four elements take the form of the four central stars of the Southern Cross constellation, while the two pointer stars represent ngā manukura (community leadership) and te mana whakahaere (autonomy) (Durie 1999).

We can draw considerable ties between digital inclusion and both Te Whare Tapa Whā and Te Pae Māhutonga, and as our research shows, being digitally included or excluded impacts considerably on aspects of both models. We particularly saw this following COVID-19, as the ability to be digitally included meant that whānau were able to connect, access services and the community, participate in society and, for some, participate in marae or community affairs – all contributing to the elements of Te Whare Tapa Whā and Te Pae Māhutonga.

1.5 Digital inclusion and COVID-19

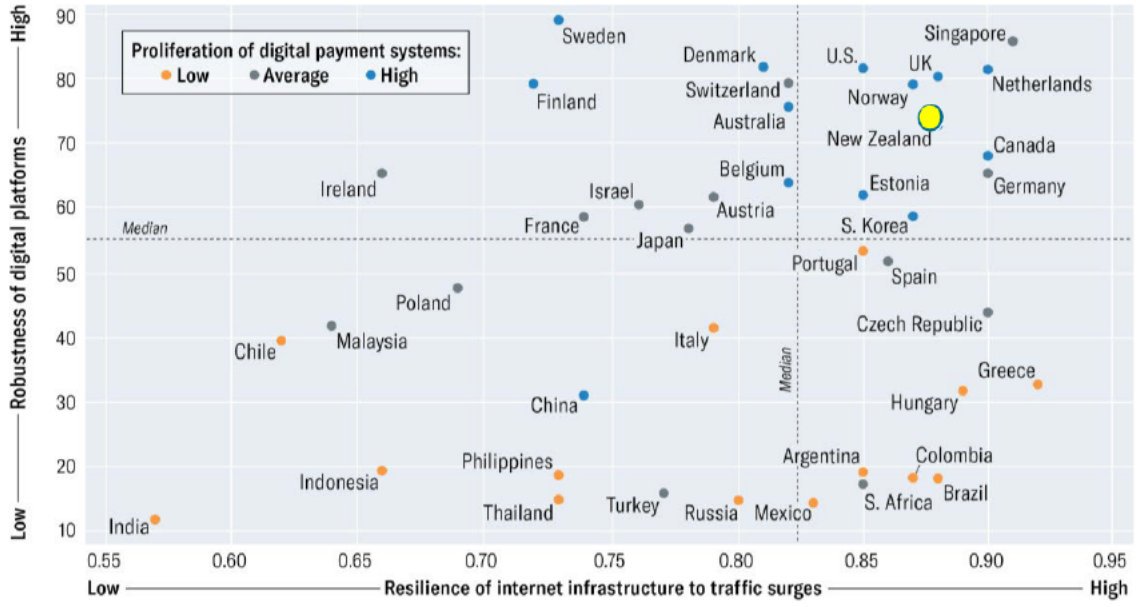
The COVID-19 pandemic saw digital access recognised as a critical resource, with stark differences in quality of life for those with and without. The ability to be online provided an essential link to work, school, friends and family for people in lockdown. Health consultations, court appearances and major events all saw new ways of operating through the internet during lockdown. Digital news also provided a major source of crucial information, sharing the latest rules, updates, locations of interest and where to find support.

The lockdowns exacerbated existing structural inequalities, with those living on or near the poverty line experiencing major hardship (Aiko Consultants 2020). Research from Australia used internet volume data to demonstrate how the ability to work from home offered greater income security and enabled self-isolation, while those without were less able to follow public health measures (Zachreson et al. 2021).

The Ministry of Education's distance learning package saw $87 million allocated to provide internet connections and devices to students (Ministry of Education 2020). Several local initiatives also responded to digital needs, including the Vodafone New Zealand Foundation releasing emergency funds and devices to community partners (Teng 2020).

At a national level, research suggests that New Zealand was amongst the most prepared countries for distanced working during COVID-19 (Figure 2). However, these aggregate measures can hide extreme unevenness within countries. The opportunity to work remotely is only available to those who were individually prepared or supported by their employers and in employment where distancing was possible.

Figure 2 International readiness for working from home



Source: Chakravorti and Chaturvedi (2020), emphasis added

1.6 New Zealand's place in the world

Several indexes measure digital inclusion internationally.

- The Economist Intelligence Unit (EIU), commissioned by Facebook, has run the Inclusive Internet Index annually since 2017. The index assesses countries on "the ability of their citizens to use the Internet for personally and socially enriching purposes" (Economist Intelligence Unit n.d.). In the 2021 rankings, New Zealand was in joint sixth place with Canada and France. The EIU notes that New Zealand fell from third place in 2020 due to a decline in "readiness" owing to weakened trust in online privacy, non-government websites and apps, and social media. "Relevance" also deteriorated due to the under-use of e-health, e-finance, e-commerce and e-entertainment. This suggests that, relative to other countries, some online services are under-provided in New Zealand.
- The World Internet Project is an international survey on internet availability and use. In the 2021 iteration of the survey in New Zealand, 94% of New Zealand respondents were current internet users, which was the same as in 2019 (Diaz Andrade et al. 2021; Cole et al. 2019). By age, those 65+ were the lowest internet-using group at 84%. The last international comparison report from the World Internet Project was in 2019, so a cross-country update following COVID-19 is still under development.
- The OECD's Going Digital Toolkit tracks 33 indicators spanning seven policy dimensions: access, use, innovation, jobs, society, trust and market openness (OECD 2019). According to the toolkit, New Zealand's best-performing indicators were "small firms selling online" and "adults proficient in problem-solving with technology", but indicators were lagging on "ICT patents" and "public sector spending on active labour market policies".
- While international measures help us understand the under-performing areas at a national level, they do not always capture the distribution of these benefits. For example, according to the Inclusive Internet Index, New Zealand scores highly on measures relating to literacy, educational attainment, government support for digital literacy training and government website accessibility. However, the index does not capture who within New Zealand attains or benefits from these high scores.

1.7 Structure of this report

The remainder of this report is structured as follows:

- Section 2 outlines our research questions, approach to addressing them and study limitations.
- Section 3 discusses the benefits of digital inclusion, drawing from literature, evidence from data and a survey.
- Section 4 summarises a literature scan on the characteristics of promising digital inclusion interventions.
- Section 5 outlines three scenarios for a future of digital inclusion and considers their costs and benefits.
- Section 6 discusses implications for government investment and policy approaches.
- Appendices provide further detail from our literature scans, data analysis, survey and cost and benefit calculations.

2 About the research

We sought to answer the following research questions:

- Why should government invest in digital inclusion?
- What is the value of increasing digital inclusion?
- What are the characteristics of promising interventions for increasing digital inclusion?
- What are the barriers to successful interventions?
- How can we best optimise investment in interventions?
- What are the risks of digital transformation without digital inclusion?

2.1 Defining the research questions

We defined the research questions in the following ways:

- Why should government invest in digital inclusion?
- What is the value of increasing digital inclusion?

One way of demonstrating a case for investment in intervention programmes is through measuring the costs and benefits. However, measuring the costs and benefits of digital inclusion for Aotearoa New Zealand's economy is challenging because the benefits are diverse and context-dependent and there is little information on the effectiveness of existing digital inclusion initiatives. As well as these traits, data to measure digital inclusion is scarce in Aotearoa New Zealand compared to other OECD countries.[2] Despite these challenges, previous studies and valuation methods offer credible ways to estimate the value of digital inclusion, which we have drawn on to distil the measurable benefits of internet access and costs of potential interventions.

- What are the characteristics of interventions that show promise for increasing digital inclusion?
- What are the barriers to successful interventions?
- How can we best optimise investment in interventions?
- What are the risks of digital transformation without digital inclusion?

We used literature scans and stakeholder engagement to understand the characteristics of promising interventions and the barriers to implementing such interventions. We also considered how to optimise investment in interventions to understand how New Zealand can achieve the biggest benefits for the smallest cost when it comes to increasing digital inclusion. This included consideration of the importance of digital inclusion keeping pace with digital transformation to ensure that no-one is left behind.

[2] For example, the Australian Digital Inclusion Index measures access, affordability and ability using surveys over time, creating a detailed understanding of the critical barriers to inclusion.

2.2 Research approach

Our overall research process is illustrated in Figure 3. To answer the research questions, we used four main information sources – existing literature, individual-level data, a survey and stakeholder engagement.

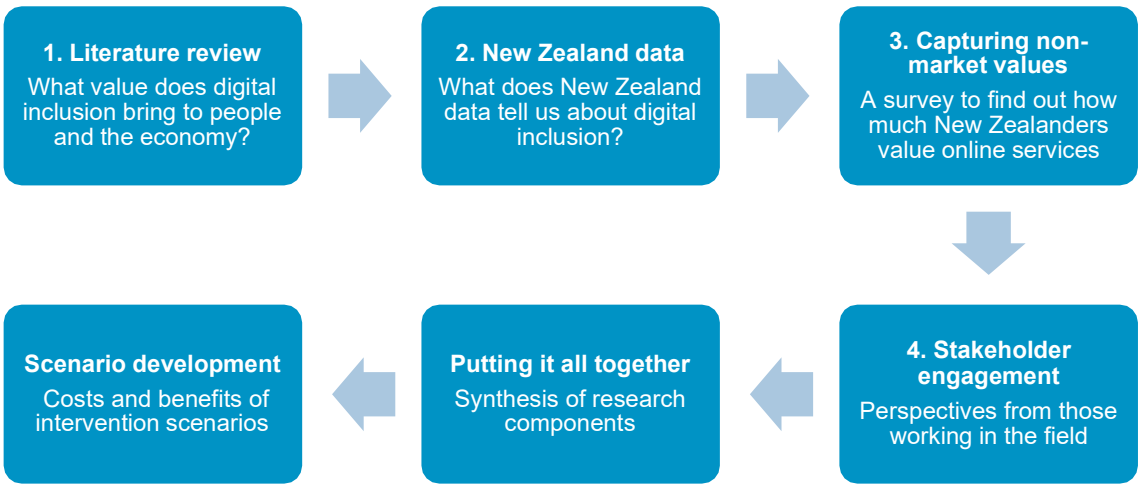
2.2.1 Literature

We drew on a range of literature concerned with defining, measuring and addressing digital inclusion. In particular, we used previous studies that measured the benefits of digital skills in the UK (Cebr 2018) and surveys to understand how much people value having internet access (Brynjolfsson, Collis and Eggers 2019). We conducted two literature scans to identify the benefits of digital inclusion and how to measure them (Appendix A) and the characteristics of successful interventions to address digital inclusion (Appendix B).

2.2.2 New Zealand data

We used data to understand the current state of digital inclusion in New Zealand. One key source was the 2018 Census, which included a question on internet access in the household. We used individual-level Census data to observe household size, age, income and ethnicity within those households without internet access in 2018. These data sources were available through the IDI, which is linked administrative data maintained by Stats NZ. To our knowledge, this is the first time the IDI has been used to explore digital inclusion in New Zealand.

Figure 3 Steps to answering the research questions



Source: NZIER

2.2.3 Willingness-to-accept survey to measure the value of free online services

Some of the benefits of internet access have direct measurable financial effects, like earnings and employability. However, there are many benefits that are more challenging to measure or monetise. Once a person has a connected device and the skills, motivation and trust to use it, there are seemingly endless benefits that come at no additional cost. Access

to free online services has clear value to the user, but without market prices to indicate how much value, they risk being overlooked. Through this survey, we uncovered hidden benefits of internet access. While we do not include the willingness-to-accept (WTA) amounts in the valuation of benefits, because they were necessarily calculated using a sample with the internet and were informed by the study design, our findings do indicate that cost-benefit assessments are likely to underestimate the total benefits.

Brynjolfsson, Collis, and Eggers (2019) were the first to address the issue of valuing free online services using the classic non-market valuation measure of WTA. WTA captures the amount of money people would be willing to accept to compensate a loss such as to go without social media. Informed by this research, we designed and ran a survey to capture WTA for New Zealand participants, finding average WTA values for giving up internet search, email, online videos, online maps, online shopping, social media and online music for 1 year.

Our survey design was informed by Brynjolfsson, Collis, and Eggers (2019) and peer reviewed internally at NZIER and externally by the DIA digital inclusion cross-reference group, Digital Council members and Haemata Ltd. We piloted it to resolve any issues before publishing the survey. The survey was disseminated through snowball sampling and social media and through a consumer panel.[3]

Our sample included 1,025 responses. We included demographic questions prior to the decision-making exercise, capturing gender, age group, ethnicity, disability status and household income group. These questions were in line with Stats NZ survey standards.

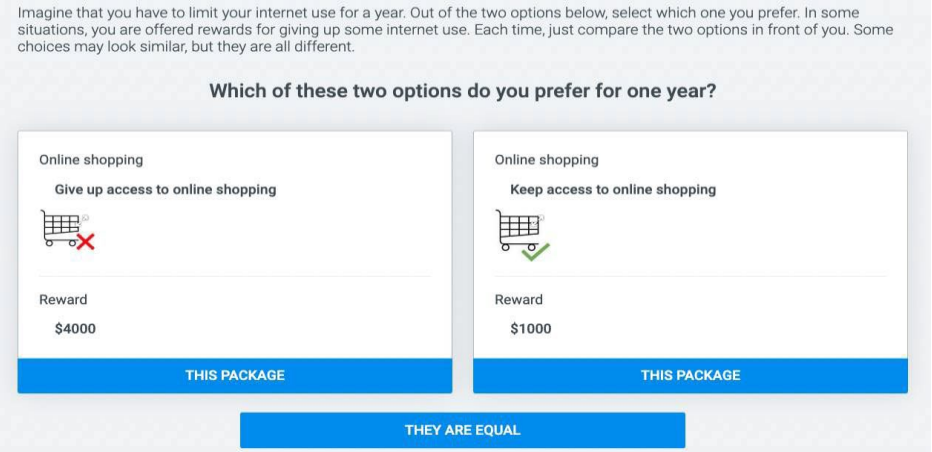
We used 1000minds, an online platform for decision-making and conjoint analysis, to carry out the survey. 1000minds was developed in New Zealand by Paul Hansen and Franz Ombler and has been used by corporate and government organisations including the Ministry of Health, Google and the World Health Organization. 1000minds uses a method called 'potentially all pairwise rankings of all possible alternatives' (PAPRIKA). In this approach, survey participants rank alternative scenarios, resulting in a clear idea of their preferences. Figure 4 shows an example of one trade-off. Each participant sees trade-offs based on their previous selections. In this survey, the median number of trade-offs a participant completes is 33.

For each trade-off, the participant may be required to choose between retaining access to one internet service for a year and giving up another service. In some of the trade-offs, they are offered a hypothetical 'reward' between $0 and $5,000 for giving up access. Including a financial component in the survey allows us to estimate WTA values.

Typically, attributes in a conjoint analysis survey use levels that vary the amount of the attribute. For example, in an internet context, this could mean that, within the social media attribute, the participant can trade off different amounts of time each day (for example, limit time to 10 minutes or 1 hour per day). However, during the pilot phases, we found this approach was confusing to the user as participants were not familiar with imagining such restrictions. We modified the survey to use binary outcomes in which the participant can choose to be with or without a service.

[3] We used ConsumerLink, a New Zealand-based panel provider with a Flybuys incentive for participants.

Figure 4 Example 1000minds survey question



Source: NZIER, using 1000minds

2.2.4 Stakeholder engagement

Unavailable data and the limitations of a monetary-based framework mean that there are inherent limits to attempting to describe all benefits quantitatively. We used a range of stakeholder meetings and available literature to enrich our understanding of benefits, with particular focus on the benefits reported by Māori, Pacific peoples and disabled people.[4] These engagements also helped us understand the scope, success and costs of existing digital inclusion initiatives. We spoke with people from:

- Citizens Advice Bureau
- Moana Research and Digifale
- Digital Inclusion Alliance Aotearoa
- Federated Farmers
- Digital Equity Coalition Aotearoa (DECA)
- Workbridge and Blind Low Vision NZ
- DIA Māori Digital Strategy
- DIA Cross-Agency Digital Inclusion Reference Group.

2.2.5 Cost-benefit analysis

We developed three scenarios for digital inclusion interventions. For the first two scenarios, we broadly captured the costs and benefits of the interventions using an approach of identifying all the benefits, quantifying those benefits where possible and assigning a monetary value where possible. We followed an existing cost-benefit analysis carried out by Cebr (2018), which estimated the costs and benefits of digital skills training in the UK. With many benefits unquantifiable, we are unable to fully account for the benefits in their entirety. However, by comparing two similar scenarios with and without co-design, we get a sense of the relative value of integrating this approach.

[4] Throughout this report, we use the term 'disabled people' in line with disability etiquette set out by the Office for Disability Issues https://www.odi.govt.nz/home/about-disability/disability-etiquette/

2.3 Limitations

As is typical of research, our findings come with several limitations.

2.3.1 Data limitations on digital inclusion in New Zealand

We relied on Census data to:

- measure inclusion costs and benefits
- explore differences between households with and without the internet.

There are two limitations with this approach. First, home internet access is just one component of digital inclusion and does not tell us whether the internet is actually used or if the household members have the skills, trust and confidence to use it. Second, the digital-first approach of the 2018 Census saw reduced response rates for Māori and those without the internet. This suggests we are likely to overestimate the reach of internet access in New Zealand. We discuss these limitations further in section 3.1.2.

In general, there is scarce data on digital inclusion in New Zealand, which has been previously acknowledged by researchers (DIA 2019). International surveys demonstrate that it is possible to collect digital inclusion data to assist monitoring and evaluation. One of the most developed country-level indexes is the Australian Digital Inclusion Index (ADII), which uses an annual survey to capture relevant data across Australia. The ADII tracks internet inclusion across access, affordability and digital ability, providing high levels of detail given the nature of the surveys. This index demonstrates that, while aggregate digital inclusion is improving in Australia, it is still differentiated along geographic, social and socio-economic lines (Thomas et al. 2021).

Of the digital inclusion benefits we identified, only a selection are quantifiable given the data we have in New Zealand. This left many benefits unvalued in our scenario analysis and estimation. For example, we assigned monetary values to increased earnings from digital inclusion but not to the intergenerational wellbeing impact of internet access. We treat our estimates as ballpark figures, not precise estimations. We assume that future needs to meet a baseline of digital inclusion are not meaningfully different from needs today, but major leaps in technological development may change the digital landscape at any time.

2.3.2 Identifying promising interventions

There are few long-term evaluations of digital inclusion interventions in New Zealand and internationally, which means we drew our conclusions on the basis of available evidence and conversations with stakeholders. Our research identified a gap in strong evaluation of initiatives. It will be critical to close this gap in future to ensure evaluations better inform our understanding of what works and what does not. While some evaluations point to short-term positive outcomes and demonstrate qualitatively that people value gaining access to the internet, we can say little about long-term implications or scale of the impact.

2.3.3 Capturing WTA in a hypothetical setting

Several aspects of the WTA results were influenced by the survey design, including the framing of the rewards and timeframe. Our survey presented participants with trade-offs to determine relative preferences and WTA values. However, these were hypothetical situations and evidence suggests that real-life scenarios can be different to stated preferences. We discuss these limitations in more detail in Appendix C.

2.3.4 Cost-benefit analysis limitations

Monetary estimates of the benefits are an important part of understanding the value of digital inclusion in Aotearoa New Zealand. However, we recognise that a monetary valuation cannot fully capture all the benefits of digital inclusion that are experienced by New Zealanders at home, in our communities and in our economy. The nature of a such a calculation in the context of digital inclusion overlooks the lived experience of many. We therefore combined our quantitative analysis with stakeholder engagement and details drawn from local and international digital inclusion literature.

Applying a cost-benefit analysis framework is reliant on several assumptions. For example, we applied a discount rate of 6% as the New Zealand Treasury recommended rate for telecommunications, media and technology, and IT and equipment. Discount rates are applied to cost-benefit analyses because they account for time preferences. However, the choice of discount rate can have a large impact on the outcome of analysis and, if set too high, can under-value the benefits to future generations. Given that digital inclusion has the potential for substantial future benefits, particularly for Māori and Pacific peoples who are likely to experience digital under-inclusion from a younger age, this discount rate may under-value the true future benefit.

2.3.5 Applying the WTA model to te ao Māori

The collection of WTA values for Māori is not as simple as the existing literature presented further in this report suggests. While there may be use in the tool for the general population, the available literature does not specifically consider the likely effectiveness of this tool (or any survey tool) for the Māori population. In general, survey tools are not as effective for gathering Māori voice as they can be for other subgroups, and while the findings of this report are considered using the Three Cs and Three Ds framework (presented below in section 2.4), the extent to which the ideas in that framework find 'voice' through the 1000minds tool is limited. In terms of further research to greater understand the value of digital inclusion to Māori, an alternative approach to capturing this voice will be needed. That might be in the form of focus groups of key informants and stakeholders that include both digitally included and excluded individuals where the kaupapa is explored in more depth from a Māori world view.

2.4 Te ao Māori considerations

While we carried out this research using methods that are distinctly Euro Western, it is important to understand digital inclusion in the context of Aotearoa New Zealand's history of colonisation (which has not ended) and is experienced through intergenerational trauma that affects Māori outcomes and wellbeing today. This continues to see Māori starting from 'behind the line' and means that specific interventions are required to bring everyone up to the same level.

We engaged with Haemata Ltd (a Māori professional services consultancy) and considered our findings using their Three Cs and Three Ds framework:

- **Colonisation:** Be cognisant of colonisation and its impacts on both Māori individuals and collectives and their approach to digital inclusion.
- **Culture:** Understand the impact of Māori values and beliefs on economic modelling and the intergenerational view of development.

- **Collective experience:** Consider the experience and views of the collective, including iwi, hapū and whānau.
- **Disparity of income and housing:** Decades of disparity because of government and local government policies mean Māori are over-represented in terms of digital under-inclusion.
- **Demography:** The Māori population is young, with a median age of around 26 years (Stats NZ 2021b). This means that much of the data and analysis on Māori is taken at a younger age, and policies delineated by age can be inappropriate.
- **Distrust:** Many Māori do not trust 'the system' based on historical and current experiences, and as a result, many choose not to engage with it. Inconsistency in government policy and implementation reinforces this perspective.

In the context of this project, this framework provides a baseline for understanding that:

- Māori (along with other cultures) are not homogeneous
- while interventions put in place through the current system serve many, there are still those who the system fails to engage
- we need to consider the approach and application of the research tools to non-Euro Western cultures (for example, Māori and Pacific peoples)
- specific interventions designed to address a general need will not always be sufficient for all demographics and cultures
- we need to work with communities in a co-design and co-decide ways to develop specific interventions (by Māori for Māori)
- the values and measures used to understand the benefits and costs of digital inclusion need to have relevance and be of value to Māori and Pacific peoples.

2.4.1 Limitations of analytical approaches

While this research benefited from engagement with Māori, it was not inherently a kaupapa Māori-led project. The research practices, tools and analytical approaches adopted are of a Euro-centric view, and the application of a te ao Māori lens over that view often leads to a dimmed Māori voice or the Māori voice being tainted as it is considered through the non-Māori view. For the Māori voice to be 'heard', further research based on kaupapa Māori research principles needs to be undertaken to fully understand the disproportionate impact that digital inclusion has on Māori.

In the context of this project, there are several limitations to the analytical approaches that have been adopted:

- **Colonisation and distrust:** The effects of colonisation and the resulting distrust Māori have in the 'system' means that we need to be cognisant of the Māori response to this research. This distrust often results in a lower Māori response and dimmed Māori voice – the low Māori response rate for the 2018 Census highlights this ongoing impact.
- **Collective experience and culture:** The WTA approach is a useful non-market valuation tool for the purposes of this research as this enables a quantifiable measure of the value of digital services to Aotearoa New Zealand. As a result, WTA values are appropriate for examining a concept of value but cannot reveal the entire

economic contribution of digital inclusion alone (Roskruge, Morrison and Maxwell 2017). There is also difficulty in applying an ao Māori lens to this tool as there are inherent characteristics associated with this tool that are inconsistent with ao Māori principles and an ao Māori approach.

- **Culture:** When considering costs and benefits, we used a time horizon of 10 years because the requirements of digital inclusion are likely to change in the future. However, this means we do not capture the intergenerational benefit of digital inclusion.
- **Demography:** Demographic differences mean a one-size-fits-all approach to digital inclusion intervention packages will not be appropriate. Recent evidence of the issues with a one-size-fits-all package sits with the COVID-19 vaccination rollout where many Māori were left without access to the vaccine for many months, disproportionately affecting COVID-19 health outcomes for Māori.

3 Why invest in digital inclusion?

In this section, we draw on literature to examine the benefits of digital inclusion and build a rationale for investment in interventions designed to increase digital inclusion. We discuss:

- evidence showing that people without internet access are likely to have compounding social and economic exclusion risk factors
- the benefits of digital inclusion to people, society and the economy
- our findings on how much value New Zealanders place on access to online services
- the potential drawbacks that can arise from internet use.

3.1 People without internet access are likely to have compounding social and economic exclusion risk factors

Evidence shows that people without internet access are likely to experience other disadvantages, with these disadvantages both contributing to and compounding their levels of digital under-inclusion. We drew this evidence from New Zealand and Australian literature and New Zealand administrative data.

3.1.1 Literature on groups at risk of digital under-inclusion

Several New Zealand sources have previously identified groups most at risk of digital under-inclusion. A 2017 report to Ministry of Business, Innovation and Employment (MBIE) and DIA consolidated research from New Zealand and overseas to identify families with children in low socio-economic communities, people living in rural communities, disabled people, migrants and refugees with English as a second language, Māori and Pacific youth, offenders and ex-offenders, and seniors as priority groups for targeted support (Digital Inclusion Research Group 2017).

DIA commissioned additional research to identify groups most likely to be digitally under-included (Grimes and White 2019). This research used four large-scale surveys to identify groups prone to having relatively low internet access compared to the general population, 91% of which had internet access. Internet access levels for these at-risk groups were:

- over 75 years – 60%
- people living in social housing – 69%
- disabled people – 71%
- those not actively seeking work – 82%
- Māori – 87%
- people living in country towns (10,000–25,000 population) – 87%
- unemployed people – 88%
- Pacific peoples – 89%.

While the research did not identify overlaps between groups, we expect these are significant. The research noted that people living in social housing and disabled people

were likely to have the most to gain from digital inclusion and that the low rate of access for those aged over 75 was likely to be a generational gap that will close over time.

Drawing on both these reports, the *Digital Inclusion Blueprint – Te Mahere mō te Whakaurunga Matihiko* identified the groups as being at risk of not being digitally included as Māori, Pacific peoples, people with low housing stability, people with low incomes, people with low literacy levels, people with mental health conditions and unemployed people (DIA 2019).

There is some similarity between people most at risk of digital under-inclusion in New Zealand and in Australia. Good Things Foundation Australia (2021) found that Australia's most at-risk groups were disabled people, people with mobile-only connection, people with low levels of education, low-income households, the unemployed, First Nations people, new migrants and refugees, those living in rural areas, women and people aged over 65. Other international research shows that rural communities can face less digital inclusion driven by an inability to physically access the internet (Wilson et al. 2018).

3.1.2 Evidence from New Zealand administrative data

We used data in the IDI to explore and compare the features of households with and without the internet. In this analysis, we identified patterns, not causal relationships. We did not attempt to explain what is caused by differences in internet access due to the extent of factors we could not control for and interactions between them. However, this analysis still contributes to our understanding of the features of households who were without internet access in 2018, and to our knowledge, this is the first attempt at using the IDI to address a digital inclusion research question. Further information is available in section A.7.

What is the Integrated Data Infrastructure?

Maintained by Stats NZ, the IDI joins administrative data at the individual level across a range of government agencies. Due to the sensitive nature of the data, it is stored securely and is only accessible through approved data labs. Output from the IDI is checked for security concerns by the Stats NZ IDI team. All counts are randomly rounded, and any averages are based on these rounded numbers.

3.1.3 What we did

Taking a Census 2018 question as an indicator for internet access, we sought to understand features of households without home internet by asking the following questions:

- What are the observable differences between households with and without the internet?
- What do we know about people living in these households with and without the internet?

3.1.4 What we found

Older people living alone, Pacific peoples and people with more severe disability were less likely to have home internet access in New Zealand

- According to the 2018 Census, 12% of households and 9% of individuals did not have internet access at home.
- Correlations between demographics and socio-economic indicators were in line with previous research. People in households without internet access were more likely to be Māori or Pacific peoples and had lower incomes on average.
- 31% of people living alone did not have home internet. This group included many who are over 65 and many who received a pension as their primary income source.
- 24% of Pacific peoples lack home internet – three times the incidence for New Zealand Europeans and 1.7 times the incidence for Māori. Māori and Pacific peoples were particularly over-represented amongst younger people without home internet access, suggesting greater potential for lost earnings and employment benefits over a lifetime.
- By region, the West Coast and Gisborne had the lowest internet access at 77% and 78%. However, when divided at a more granular level, the areas with lowest internet access were distributed across the country.
- People with more-severe disability were less likely to have home internet – 26% of people who reported being unable to see at all were without home internet as were 25% of people who could not hear at all and 24% of people who had a lot of difficulty walking.
- The IDI lacks digital inclusion indicators. The 2018 Census is the best data source, but the low response rate, particularly for Māori and Pacific peoples, raises issues with reliability and interpretation.

The data showed that people without home internet largely fell into two groups. Those in single-person households without internet were more likely to be older and New Zealand European and had roughly the same income as their counterparts with home internet. Those in multi-person households without the internet were more likely to be Pacific peoples or Māori in crowded households and had lower income.

Given that the number of older people in single-person households without internet is likely to naturally reduce over time (Grimes and White 2019) and those with and without internet at older ages have similar incomes, suggesting motivation as a key driver in different internet use, households falling into this second group are a clear place to start for increasing digital inclusion. The lifetime benefits that can be gleaned from access to the internet from an earlier age indicate that starting here has greater marginal benefits and the potential to address inequity.

Barriers to internet access are unclear

From a policy perspective, it is unclear what reasons drive those without the internet. For those aged 71+, it is possible that being without internet is a 'default setting' and this digital divide driven by age will naturally reduce over time as more digital natives enter older age, as suggested by Grimes and White (2019). The stark difference in average incomes affirms that affording an internet connection or prioritising internet with a limited budget may

prevent many from having a connection at home. This finding is well aligned with previous qualitative research (Elliott 2018; PeopleForPeople (now Fibre Fale) 2021).

We do not see rural internet access appear as a key group, which may be due to the reductive nature of the Census question. However, these findings suggest that investment could be more efficiently targeted towards those groups identified without internet access where infrastructure is already in place but inaccessible to some.

Administrative data limitations

The IDI is invaluable for understanding public policy issues in New Zealand and is a key resource for extensive research in topics including health, justice, education and immigration. However, there are specific challenges relating to the nature of digital inclusion that limit the usefulness of the IDI for exploring digital inclusion research questions. We address these issues below.

The IDI contains administrative records, and administration often happens online

The data processed from individual government interactions informs the statistics of government agencies, which are then collated in the IDI by Stats NZ. As more government administration happens online, these data points may be increasingly over-representative of people with internet access and under-representative of those without.

Few digital inclusion indicators recorded

There are many interrelated factors that contribute to digital inclusion. However, very few of these factors are recorded in administrative data, which means we cannot speak to the state of digital inclusion overall. Instead, we focused on access, using a Census question on internet access in the home. We discuss this in more detail in section A.7.1.

Problems with a digital-first Census

We focused on the Census question as it is one of the only sources of information on internet access in the IDI. However, the digital focus of the 2018 Census is particularly relevant in this context. The Census was criticised for its reliance on digital first, which resulted in lower coverage overall and much lower coverage for Māori. This low response rate arose partly out of the digital-first targets of the Census, a stark demonstration of the pitfalls of overestimating digital inclusion.

Stats NZ used administrative data sources to bolster the Census coverage and improve the quality of the data. 89% of the final 2018 Census dataset is comprised of Census responses, with the additional 11% provided by administrative records. These administrative sources were used to inform nearly 25% of Māori and Pacific peoples' data (compared to only 10% of responses for New Zealand Europeans). This stems from the lower participation of Māori and Pacific peoples in the Census, which is likely related to their increased likelihood of being under-included.

The telecommunications question came from the dwelling form, which, in 2018, had a better response rate than the individual forms. A dwelling form was received for 92.7% of private occupied dwellings, down from 96% in 2013 (Census External Data Quality Panel 2020). However, as dwelling data consolidates information relevant for everyone living in the household, it cannot be reported by ethnicity. Given the divide present for individual responses by ethnicity, it is likely that Māori and Pacific peoples are similarly under-represented in dwelling data.

Since information on telecommunications in the household is only collected through the Census, there are no other alternative sources to improve the data quality. This means it is likely that the 2018 Census data overestimates internet access. Stats NZ assigns this variable a moderate quality rating.[5] Poor internet access reducing data quality when addressing digital inclusion research questions is a stark reminder of the importance of digital inclusion and inclusive practices for those without.

Census question cannot speak to nuances of digital inclusion
The Census question itself also has limitations in that it informs us whether there is household internet but cannot speak to the quality of connection or whether the household members use the internet outside home.

3.2 Digital inclusion brings a diverse range of benefits to people and the economy

In this section, we summarise the benefits of digital inclusion to people and the economy.

3.2.1 Internet use brings many benefits to people

Across surveys in New Zealand, people report significant benefits of internet access. The BNZ (2021) digital skills report shows that people agree the internet helps with:

- professional development
- connection with family, friends and community
- saving time and organisation
- managing and improving physical and mental health
- finding a job
- saving money.

These findings are backed up by the InternetNZ annual online survey (Colmar Brunton and InternetNZ 2020). In this survey, the most mentioned benefits were:

- easy to communicate with friends/family
- access to information
- online shopping
- can work from home
- easier access to goods/services
- saves time.

3.2.2 People can use the internet in any way they choose – a form of mana motuhake

Different groups experience different benefits, and these benefits can apply at both the individual and community level. This all starts from the notion of being able to use the internet when you want and in any way that you choose, which can be seen as a form of self-afforded mana motuhake. The concept of mana motuhake can be translated to mean many things but is centred around the idea of self-determination. Essentially, it can be seen

[5] Stats NZ details on data quality https://datainfoplus.stats.govt.nz/Item/nz.govt.stats/42921c1a-a49d-4426-b3a9-69cfba642ba5/?_ga=2.91023130.1864554865.1641762261-1324612273.1632192100

to be the ability to control your own affairs and to take advantage of the rights and responsibilities that have been afforded to you. This can be both for your own purpose and betterment (individual value) and for the betterment and advancement of those who you live with and those that you connect with (collective value). Therefore, the idea of digital inclusion could be seen as a form of self-afforded mana motuhake – having the ability to take advantage of benefits such as those outlined in Table 1 below for both your own and your community's advancement.

Table 1 The benefits from digital inclusion for different groups

Māori	Pacific peoples	People with disabilities
• Learning opportunities • Communication • Access cultural information • Work and do business • Carry out cultural practices • Do business on the marae	• Access to government services • Work and do business • Access stable employment (for example, in STEM) • Increase diversity in the tech sector and government agencies • Connect with family • Learn and share culture	• Assist and empower • Independence (for example, online shopping) • Increased employment opportunities

Source: NZIER, using DIA (2021a)

Research collated by Digifale, which advocates for digital equity for Pacific communities, tells stories of Pacific experiences of the benefits of being online. These include examples of bringing Pacific traditional arts online (People for People 2021), better access to healthcare services through telehealth (Bridget Wilson et al. 2021) and staying connected with friends (DIA 2021b).

Harrison (2020) notes that disabled people can see greater benefits from digital inclusion as it enables access to many services that can be otherwise exclusive. This comes with a need for service providers to meet digital accessibility requirements to ensure the full benefits of their services can be realised by the disabled community.

International evidence finds similar benefits from digital inclusion. The Australia-based Digital Inclusion Initiative provided connections, computers and user support for public housing residents (Infoxchange 2009). Melbourne's Atherton Gardens Estate was included in the initiative in 2002, with approximately 800 properties connected, 900 computers installed and 1,500 residents trained. Reported benefits included:

- greater feelings of empowerment and equity of access
- increased computer literacy enabling greater interaction between residents
- increased ability for school-age children to complete research, assignments and homework using home internet.

Another study from Australia on the impact and benefits of digital inclusion for social housing residents noted that ICT use could have a positive effect on a community's collective social capital (Broadbent and Papadopoulos 2013).

3.2.3 Digital inclusion can bring social benefits

The research in the previous sections identified correlations between being without internet access and having lower income, lower unemployment and a greater reliance on benefits but cannot speak to whether increasing digital access would improve outcomes. However, there is some evidence to show that increasing internet access can reduce inequality. One study in the United States (US) found that increasing internet penetration by 1% increased employment by 0.3%, helping 400,000 people find jobs. They also found people who gained internet access used it to search for jobs, training and government support (Crandall, Lehr and Litan 2007).

The impact of digital inclusion on social cohesion is less clear. Williams (2013) investigated the impact of New Zealand's Computers in Homes scheme on social cohesion and community outcomes. In this study, social cohesion was broken down into individual components (social connectedness, routine day-to-day life, inclusiveness, support, place attachment and identity) and group components (networks of mutual support, social capital and social solidarity). Williams found that, rather than the internet causing greater social cohesion, ongoing internet use was more successfully embedded if social cohesion was pre-existing. Further, Koi Tū: The Centre for Informed Futures warns of the threats of the internet and new media in sustaining social cohesion in the future (Koi Tū 2021). However, given that digital under-inclusion specifically affects people and communities with other disadvantages, reducing the digital divide may contribute to greater overall social cohesion.

3.2.4 Internet use brings large benefits to the economy

Digital inclusion has benefits for the whole economy through higher employment, higher tax revenue and accelerating innovation. For example, Amazon's recent decision to base cloud computing data services in Auckland was due to the region's telecommunications connections and skilled technology workforce. Amazon is anticipated to invest $7.5 billion over 15 years (Pullar-Strecker 2021). One New Zealand study estimated that a 20% increase in the uptake of cloud computing could increase GDP by $3.5–6.2 billion (Bealing, Siddharth and Leroy 2020).

Evangelista, Guerrieri and Meliciani (2014) noted that the presence of ICT infrastructure and accessibility to ICT facilities are only a necessary pre-condition for digital inclusion. The use of technology plays a more important role, with increases in GDP growth, employment and productivity arising from digital inclusion. This result aligns with research using Eurostat data that found a correlation between digital skills and employment rates in the European Union (Bejaković and Mrnjavac 2020).

In the wake of the COVID-19 pandemic, Deloitte published a report that found broadband penetration was critical to increasing jobs and GDP growth (Deloitte US 2021). It estimated a 10 percentage point increase in broadband access in 2014 would have resulted in more than 875,000 additional jobs in the US and US$186 billion more in economic output in 2019.

Many businesses benefit from more of the population being online. At the most basic level, a business selling a product can sell it online if its potential customers have internet access. People with digital skills also bring benefits when employed by businesses. In a cost-benefit analysis, Cebr (2018) estimated £1.5 billion over 10 years in benefits to businesses as a result of employees gaining basic digital skills and thus reducing skills shortages. Grimes et

al. (2009) found a substantial firm productivity boost (7–10%) from broadband adoption by the firm.

Internet access benefits small and medium-sized enterprises by providing access to the global marketplace. The internet also offers logistical support, office automation and cloud computing tools to increase efficiency in smaller workplaces (Bédard 2016).

In New Zealand, MBIE introduced the Digital Boost initiative to support small businesses to work digitally and make the most of digital tools. Research as part of the initiative found that 42% of businesses agreed they would benefit from making greater use of digital tools. The research also showed that 27% identified lack of skills as a barrier to further digital adoption (Ministry of Business, Innovation & Employment 2021).

Given that Māori businesses have 43% Māori staff compared to 14% in non-Māori businesses, greater digital use in Māori business may see significantly more benefits for those Māori who are employed in them (Nicholson Consulting 2019). These benefits can carry through to the whānau and be passed intergenerationally. Further, increasing digital use in Māori business can increase the visibility of Māori in technology roles, providing role models for younger generations.

3.2.5 Internet use may have some environmental benefits but may also cause environmental harm

Intuitively, digital inclusion can reduce transport needs by enabling access to services and work online. At the same time, the production of digital goods and energy demands of internet access can cause environmental harm. The United Nations Coalition for Digital Environmental Sustainability (CODES) acknowledges that the energy and material demands of digitisation have accelerated the impact of people on the planet, threatening stability and increasing inequality and social injustice. CODES notes that digitisation has the potential for sustainable transformation but only with deliberate effort (CODES 2022). This is an area for future research in Aotearoa New Zealand to address in order to understand how digital transformation can work for the good of the planet.

3.3 Some would need $3,500 in compensation to give up email or internet search access

It is useful to identify the benefits people gain from the internet, but these surveys alone do not help us understand how much people value these benefits. While in other domains we can observe these values through market prices, once a person is fully connected to the internet, there are seemingly endless benefits that come at no additional cost and are therefore not captured. Without an understanding of the size of these values, the benefits risk being underestimated.

Brynjolfsson, Collis, and Eggers (2019) were the first to address this issue of valuing free online services using the classic non-market valuation measure of WTA. WTA uses surveys to capture the amount of money people would be willing to accept to compensate a loss, such as to go without social media. They asked survey participants whether they would accept a specified dollar amount for giving up access to a digital service for 1 year where the participant would see only one of 15 possible price points. They also used incentive-compatible choice experiments in which some participants actually received the agreed financial reward if they did not use Facebook for 1 month.

3.3.1 Willingness to accept versus willingness to pay

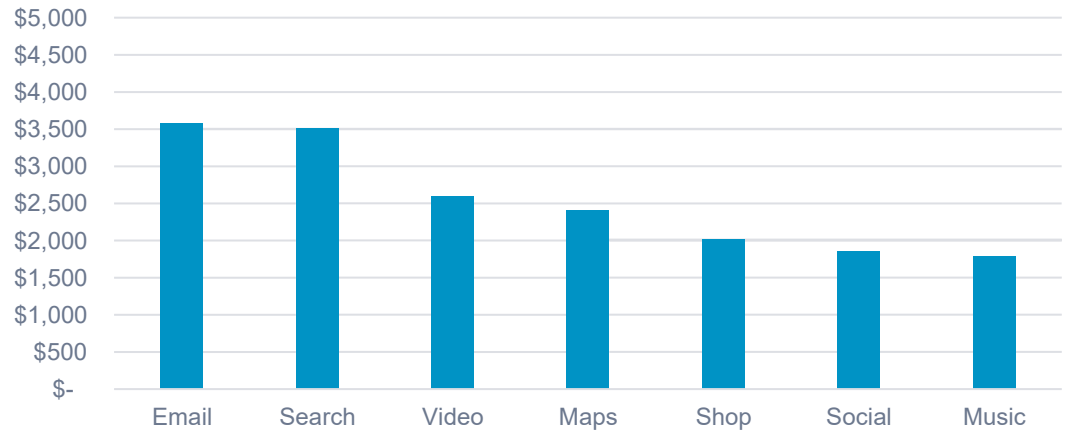
Across the literature on non-market valuations, there is much debate on the relative merits of measuring WTA compared to willingness to pay (WTP). While WTA measures the amount of compensation you would accept for giving up something, WTP measures the amount you would pay to keep it. Standard economic theory suggests that the two measures should be the same, but we know from a wealth of evidence that, in practice, they are not (Kahneman, Knetsch and Thaler 1990). This difference is largely attributed to the endowment effect where we place more value on something we already own.

Sunstein (2020) investigated the WTP and WTA comparisons of social media, finding even bigger discrepancies. The median WTP for Facebook for 1 month was US$1, while the WTA was US$59. Sunstein noted that, in using a discrete choice experiment, some of the discrepancy is removed. However, we still need to frame the question as WTA or WTP. We used WTA due to the risk of 'protest' from WTP in which people are reluctant to pay any money for something that was previously free. At the same time, we acknowledge that WTA retains its own biases.

3.3.2 WTA values in the New Zealand context

We used a similar methodology to Brynjolfsson, Collis, and Eggers (2019) and the 1000minds survey platform to derive WTA values for seven online services in the New Zealand context – internet searches, email, online shopping, online maps, social media, online music and online video. As illustrated in Figure 5, we found the highest WTA value for access to email and internet search engines at about $3,500 per year, followed by video, maps, shopping, social media and music. With a median individual weekly income of $1,093 in 2021, this is equivalent to 2–3 weeks of median income per year (Stats NZ 2021a).

Figure 5 Estimated value of 1 year of online services (all participants, WTA measure)



Source: NZIER

In Figure 6, we show group results by demographic for Māori, women, people aged 60+, household income under $70,000 and disabled people. Asterisks indicate statistically significant differences between the values for that group compared to everyone else (for example, people aged 60 and over compared to 59 and under). Broadly, the groups have similar rankings and WTA values.

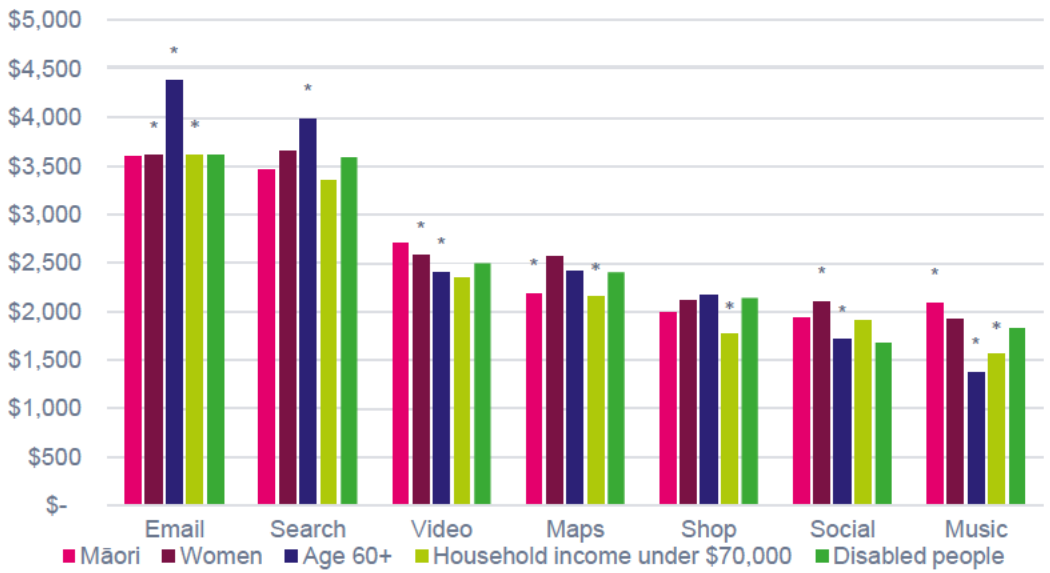
Our results show:

- people aged 60+ placed higher value on email access and internet search while putting less value on videos, social media and music
- Māori placed higher value on online music, ranking it above social media and online shopping, and lower value on online maps.
- people with a household income under $70,000 put higher value on email and lower value on maps, online shopping and music.

We see no statistically significant differences for disabled people, but this may be attributed to the smaller sample size.

Overall, we found a slightly different ranking compared to Brynjolfsson, Collis, and Eggers (2019). In their study, the researchers found online services ranked in the following order: search, email, maps, video, shopping, social media, music. They also found a much greater range in WTA values than in our survey, which we can attribute to research design.

Figure 6 Estimated value of 1 year of online services, by selected group (WTA measure)



* Statistically significant at the 95% level

Source: NZIER

Our findings demonstrate that measuring market prices alone misses potentially large benefits that people get from the internet and indicate that attempts to value the benefits of digital inclusion without including the value for free services likely underestimate the benefits. However, there are three main reasons we do not include these values when assessing the scenarios:

- **The upper limit was heavily informed by survey design.** Survey responses depended on which dollar amounts were available as options. Further research with a greater range of prices would help our understanding of the impact of survey design.

- **Risk of double counting.** There is unquantifiable overlap between this non-market valuation of services and other benefits included. For example, we capture a reduction in loneliness using other data sources, but the value from social media or email may also be partly driven by loneliness reduction.
- **Our sample was made up of digitally included people.** As an online survey, the sample was required to have internet access and skills. However, the values for people who become newly online may be different. Future research could address this by running a similar survey with a group of people who have recently benefited from a digital inclusion intervention.

3.4 The internet comes with drawbacks, which can be managed through education and support

It is tempting to oversimplify a theory of change in which providing internet connections and skills creates opportunity for the under-served with no drawbacks (Selwyn 2004). However, we know that there are several risks and harms associated with internet use, including the perpetuation of injustice through surveillance, exposure to misinformation and disinformation, privacy and security risks associated with cybercrime and harm from social media. These are risks to manage during efforts to increase digital inclusion.

3.4.1 Surveillance and the feedback loop of injustice

Gangadharan (2017) documented the expectations and experiences of privacy and surveillance among marginal internet users. This research suggested that groups that had been historically marginalised faced greater risk than others when going online.

> *… in the process of data profiling members of marginalized groups, corporations and the state can exacerbate existing conditions of inequity. From data collection to data sharing to data analysis, members of historically marginalized groups are at risk of being stereotyped, exploited or alienated. (Gangadharan 2017)*

Examples of these activities include targeted advertising of high-interest loans and low-quality news products to marginalised people, promoting unmanageable debt and excluding many from representation in and access to high-quality news. These curated online experiences create a 'feedback loop of injustice' in which disadvantage is perpetuated.

3.4.2 Misinformation and disinformation

People newly introduced to the internet can be particularly vulnerable to misinformation and disinformation online. One study into the outcomes of internet access for vulnerable populations in Canada during the COVID-19 pandemic found that some participants became more vaccine hesitant due to misinformation on social media (MacPherson 2021). Seo et al. (2021) examined how low-income older African-American adults, one of the most digitally disadvantaged populations in the US, assessed the credibility of online information. The researchers found that those with higher education were likely to be more discerning and spot misleading news stories, supporting the notion that digital literacy education and skills are key for giving people the tools to avoid misinformation. While digital inclusion is

an important component of social inclusion, without digital and media literacy, there is a risk that the internet can drive social divides.

3.4.3 Cybercrime and security

Being online increases exposure and vulnerability to identity theft, scams, data privacy leaks, viruses and phishing. Fraud and cybercrime is the most common and under-reported crime grouping, according to the New Zealand Crime and Victims Survey (Ministry of Justice 2021). People newly online and those who lack digital skills may be particularly vulnerable to online crime. In Australia, people aged 65 years and over reported the highest losses to online scams, with almost $38 million lost in 2020 (Figueiredo et al. 2021).

3.4.4 Social media harm

Many aspects of the internet are designed to be addictive, which can cause harm to users. In particular, social media platforms are engineered to keep users engaged and spending maximum time on the app or website (Montag et al. 2019). Such designs can not only drain time but can have mental health consequences as the user compares their own life with the idealised lives of others. The anonymity of social media also brings the potential for cyberbullying. A global survey by Ipsos found that cyberbullying in New Zealand was the third highest of the 29 countries surveyed (Ipsos 2018).

4 Characteristics of successful digital inclusion interventions

4.1 What works to increase digital inclusion?

We conducted a literature scan to understand what kind of interventions are used internationally to increase digital inclusion and to identify the characteristics of successful interventions. This detailed scan is in Appendix B.

We found that interventions tended to focus on providing low-cost broadband and computers, operating public access computing centres and support, and digital literacy or skills training. These interventions were offered separately (for example, subsidies for internet connections) or in combination. Broadly, new users tended to need support to set up and use devices and access internet connections at home along with ongoing technical assistance (Good Things Foundation 2021a). Therefore, interventions combining several components were more successful (Rhinesmith 2016).

There are three main sources of funding for digital inclusion projects: government funding, NGOs and corporate or philanthropic funding. Interventions are commonly provided by NGOs, with a substantial funding gap relative to demand (Citizens Advice Bureau (NZ) 2020). Government funding is an important component, often supplemented by corporate or charitable philanthropic funding.

Interventions to address digital inclusion can have different specific objectives. Assessing success depends on the objectives of the intervention and the framing of the problem. For example, if digital under-inclusion is framed as lack of access to devices and the internet, interventions that provide or subsidise devices and internet connections immediately remove the barriers.

Our literature scan sought interventions that delivered sustained impacts over time and remained flexible to technological changes. While programmes to improve digital inclusion have been in place for the last two decades (20/20 Trust 2018), a substantial number of people remain digitally under-included. This may be partly because, as one digital divide is addressed, new technology opens up new divides (Ei, Soon, and Tan 2021).

Most interventions to digital inclusion can be characterised as helping people to ‘catch up’ on access to digital devices, the internet and digital skills by helping at-risk groups in defined locations gain access to digital devices and data and to gain the skills they need for their day-to-day lives. The implicit assumption is that digital under-inclusion can be resolved by improving access to digital technology and the skills to use it.

Overall, a number of lessons emerged from this literature scan relating to digital inclusion interventions.

- **Interventions are most effective when access to devices is combined with digital skills and technical support.** Currently, many interventions focus on providing access to devices and internet connections. However, ongoing access to technical support and digital skills training is also important.
- **Strategic oversight with consistent standards, outcomes and goals is important.** However, approaches to digital inclusion intervention, both in New Zealand and internationally, are fragmented with little agreement or consistency on standards, outcomes and goals across regions and organisations. Due to budget or time limits, the impact is often unmeasured.

- **Interventions led by communities' needs and aspirations are more successful.** These interventions tend to include community leaders in the intervention design and implementation, which reflects communities' needs and aspirations.
- **Organisations leading or facilitating digital inclusion interventions that are trusted by communities are more successful**. Organisations delivering effective interventions tend to be connected to wider social and economic support networks. This is important because digital under-inclusion often occurs with other specific needs. Co-location of physical community digital hubs with other social service organisations provides the opportunity for more-holistic support, including cross-referral.
- **Community centres that provide non-digital ways to access services continue to be essential.** These centres can provide the most support if they have devices and internet access for public use and provide non-digital ways to access services, including in-person assistance. They do not necessarily address the digital accessibility needs of disabled people, who may benefit more from access to specialist equipment.

We can summarise the characteristics of promising interventions into three key themes:

- **Community-led** – interventions work best when co-designed to meet the needs of the community.
- **Flexible** – interventions should be able to adapt to change and needs.
- **Holistic** – combining access, skills and motivation components.

4.1.1 Community-led – improving the digital divide by addressing localised barriers

Different groups face different barriers to using the internet, and there is evidence that giving these groups the tools to choose what their community needs and the resources to lead the change can be effective.

Lessons from effective interventions

Programmes in First Nations/Indigenous communities in Australia and Canada provide notable examples of a systemic response to digital under-inclusion where participants determined how they wanted to use digital technology within the context of their community's needs (Guenther 2020; McMahon 2020).

Programme evaluations identified that people preferred to learn digital skills in a trusted community environment, and programmes were more successful when they met the users' own identified needs and aspirations. This suggests that digital inclusion interventions are more successful when they are community-led.

Lessons from under-effective interventions

Kvasny and Keil (2002) compared the impacts of two cities' different approaches to reduce the digital divide. In one city, the initiative took the form of community technology centres where people could get exposure to information technology and learn about computers and their applications. Another city instead provided free internet access in the home. The researchers reported that neither city saw the impact that policy makers had hoped for and highlighted that those who were most disadvantaged were exposed to training for the shortest amount of time. They summarise:

To overcome some of the structural barriers and to facilitate long-term IT use, community-based institutions must work together to develop innovative programs that provide nontraditional pipelines into more advanced IT educational and employment opportunities. Otherwise, the community technology centers and the Freenet services will be underutilized, and we will have simply created yet another system that does not support the interests of the target populations.

Creating collective value through co-designed interventions

Co-design has been identified as core to developing digital inclusion interventions by Māori (New Zealand Government 2021) and the disability community (DIA 2020a). Much of the international literature on digital inclusion interventions does not refer explicitly to the use of co-design practice. There are examples of digital health interventions that draw on co-design practice elsewhere in the sector in the UK. These interventions are focused on improving engagement on health issues rather than addressing digital inclusion per se.

Cumberland Lodge specified co-design "involving people with different kinds of lived experience at every stage of the development of new digital solutions" (Elahi 2020). Co-design helps reveal unforeseen consequences and boost accessibility and future take-up. Good Things Foundation notes that programmes are more successful when communities and individuals are asked what they want the intervention programmes to focus on (Good Things Foundation 2021c).

There are explicit examples of the use of co-design in the work of First Nations on digital inclusion in Canada. In Indigenous communities, digital skills and digital literacy (and digital inclusion) are about shaping and using digital technology "in ways that emerge from the self-determined needs of communities" (McMahon 2020, 11). Digital literacy is grounded in local cultures and understandings. In Canada, past Indigenous experience of the education system informs the delivery of digital literacy programmes for school students within First Nations communities based on co-design principles. In Australia, Telstra partnered with the Indigenous Remote Communications Association (now First Nations Media Australia) to create inDigiMOB, which engaged digital mentors to support a range of digital activities determined by the community.

Building on the lessons provided above regarding what works and what does not work in the context of localised community-led digital interventions, we considered what a successful co-design model that removes localised barriers and drives collective value in Aotearoa New Zealand might look like. While this section does not intend to set down the specific co-design model or set of interventions, it does begin to set forth some context to guide future thinking.

When considering the co-design context in Aotearoa New Zealand and unpacking what community-led digital inclusion initiatives might look like (particularly initiatives that drive collective value), we need to understand why it is important to operate in a way that ensures interventions and initiatives are community-led and what is required to achieve this approach. It is important because the evidence suggests that solutions that are created and owned by the community they are designed to serve are not just better received but are more effective. Implementing such solutions requires valuing local ideas and distributing localised power to communities, empowering them to serve the needs of their own community.

In the context of te Tiriti o Waitangi and Māori-Crown relations and what this means for co-design in Aotearoa, it follows that interventions will need to embed a form of parallel thinking where both Māori and Western knowledge bases are acknowledged and there is an understanding of when one knowledge base may be referred to over another.

Te Arawhiti's framework for Crown engagement with Māori presents a continuum that can help guide government thinking on the co-design of future initiatives. While it is designed with Māori-Crown relationship in mind, it could equally be used for government's work with other communities. In this framework, Co-design is defined as the Crown and Māori partnering to determine the issue/problem, design the process, and develop solutions. The Collaborate model is similar but sees each party (the Crown and Māori) retain their own decision making ability. Decisions about which model to use are guided by the significance of the issue for Māori and how they will be affected, either now or in the future.

Māori approaches and solutions (when appropriate) tend to be particularly collective, often spiritually informed and are often particularly localised rather than nationalised. Considering this in the context of the co-design spectrum and the Three Ds and Three Cs framework, proposed interventions to improve digital inclusion amongst Māori will need to weave the best of both Māori and Western knowledge bases together in a way that empowers communities, addresses localised barriers and increases trust.

Māori entrepreneurship in the context of digital inclusion

To successfully drive co-designed interventions in Aotearoa New Zealand, igniting rangatahi voice and potential is critical. One way of achieving this is through ensuring that appropriate role models are in place. This is particularly important within the area of Māori-tech – there are many Māori-tech innovators (for example, Nau Mai Rā, Ariki Creative, Arataki Systems) that government will need to form relationships with in order to successfully drive co-designed interventions in the community. This will drive the 'Māui-factor' and see digital inclusiveness being embraced by rangatahi Māori, fostering increased creativity, adaptability and innovation that drives better community-level outcomes in the digital space.

4.1.2 Flexible – adaptive to different needs

Interventions work best when they have the flexibility to adapt to the needs of the user as well as changes in the requirements of digital inclusion. Hsieh, Rai and Keil (2008) unpacked the behavioural models driving internet use after the internet is freely provided and how these differed for the socio-economically advantaged and disadvantaged. The authors noted that, since the benefits of internet access only occurred through sustained use, effectively reducing the digital divide required long-term behaviour change, which had barriers beyond access alone. The authors suggested that effective interventions needed to configure resources that aligned with the distinctive needs of different groups. While this often comes with higher administration cost, it may also lead to lower implementation cost as well as effectiveness as resources are directed only to where they are needed and are likely to produce more-effective long-term outcomes.

4.1.3 Holistic – infrastructure and affordable access are necessary but not sufficient

Some parts of the population are digitally under-included because they do not have access to reliable and resilient connectivity in rural, semi-rural and urban areas. Aotearoa New Zealand is one of the leading countries for internet connectivity (OECD n.d.), but there are

still gaps that reflect the high cost of investment to complete the ‘last mile’ of infrastructure or to upgrade existing connections to meet current standards. Nevertheless,

digital infrastructure is the backbone for digital inclusion as an important starting point for enabling any digital access.

Internet connection in the home is a significant cost for low-income households and is not a priority when household budgets are under pressure. Programmes to subsidise connection costs as well as provide devices can help low-income households overcome one significant barrier but may not actually result in uptake of internet use alone.

Digital skills training is important but never free

Like literacy and numeracy, digital skills and capability are part of human capital that we use in social, cultural and economic interactions. Digital skills training is one of the key ways to upskill those who are left behind. These skills can enable people to learn, interact, use digital services and work. However, even when freely provided, attendance still comes at costs to learners. This can include the cost of transport, time spent learning, childcare or other work forgone. Without full understanding of the long-term benefits from digital skills, these barriers can prevent many from attending (Kvasny and Keil 2002). Designing and delivering interventions with the community they target can help identify and reduce the barriers for attendees.

Maintaining non-digital access to services

One way to prevent the negative effects of digital under-inclusion from growing is by continuing to provide non-digital services so those that cannot or choose not to use the internet still have the best opportunities for reaching services. Supporting a network of trusted community hubs such as marae, libraries and Citizens Advice Bureau that assist people to access digital services is widely used internationally.

4.2 What could be improved?

4.2.1 Evaluation

Evaluation of digital intervention programmes is generally qualitative, with an emphasis on the number of participants and their user experience. There is little evidence of evaluation that follows a person's experience over, for example, a 5-year period. As a result, it is difficult to establish whether interventions provide a permanent or temporary improvement in digital inclusion. Anecdotal evidence in Aotearoa and from user surveys suggests that many interventions to improve access only have a temporary impact so that the under-included move in and out of inclusion (Lloyds Bank 2021).

Most reports on digital inclusion interventions identify the lack of robust and detailed data to better understand the size and locus of digital under-inclusion. All point to the need to collect more data, which would also help to measure the impact of interventions. In New Zealand, there is very limited measurement of digital inclusion indicators. Digital collection of data skews the results because people who do not use digital technology are excluded.

Any investment in digital inclusion should provide for ongoing evaluation with pre-determined research questions, data collection and the flexibility to adjust if the intervention is ineffective. We anticipate that a combination of qualitative evaluation, focused on user experience and perspectives, as well as quantitative, capturing the impact on measurable outcomes, will provide the most comprehensive and clear story of the intervention effectiveness.

4.2.2 Funding

There is little readily available information on the cost of delivering specific programmes and a lot of commentary on the need for more and consistent funding for providers across the world. Funding and programme sustainability is an issue. In the US and Canada, few programmes are fully funded or have funding for the full suite of interventions. Because government programmes to subsidise low-income families are time and income bound, they provide only short-term benefits (Hudes 2021). NGO providers often supplement government funds, when available, with business or philanthropic funding and support.

4.2.3 Integrating digital inclusion

Many interventions take a catch-up approach, providing devices and internet access to low-income households. This is necessary but not sufficient to ensure that people are digitally included in a meaningful way in the medium to long term.

The international literature identifies successful elements across a range of programmes. These suggest that programmes to help those that are digitally under-included need to be broad-based and include access to appropriate devices and the internet, technical support to manage devices and connect to the internet and the opportunity to gain digital skills and literacy. Interventions should be appropriate to cultural and learning needs.

Subsidy programmes for low-income households to purchase devices and internet plans are designed to meet an immediate need, but if access to the internet is considered a basic service (McMahon 2020), long-term affordability of communications services needs to be considered (Hudes 2021; Good Things Foundation 2021a). Government can subsidise access in the short term, but telco providers need to offer affordable options in the long term. This may come about if the cost of technology falls but may require some regulatory intervention.

There is widespread recognition that digital under-inclusion is both a function of social and economic exclusion and also contributes to social and economic exclusion by reducing access to services, education and work. This implies that digital under-inclusion is a systemic issue that requires system-wide consideration and responses. We have not identified any literature that sets out a systemic approach that, for example, embeds digital inclusion interventions into learning and employment pathways.

Integrating digital inclusion into the policy environment requires reconsideration of the purpose and role of policy and agencies. For example, in Canada, the Canadian Radio-television and Telecommunications Commission (CRTC) reviewed its policy for basic telecommunications services, which raised the minimum standard and increased funding for under-served areas.

There is an implicit assumption underlying many of the intervention programmes that digital under-inclusion can be fixed so that special interventions will no longer be required. Digital inclusion is not a stable state and needs to be better integrated into government and business planning. Continuing technological innovation, upgrades of infrastructure and hardware and continual learning and accessibility requirements will contribute to new waves of digital under-inclusion (Ei, Soon, and Tan 2021).

Ultimately, digital inclusion is an investment in social inclusion, equity and intergenerational wellbeing. Basic interventions will not be sufficient to overcome the structural drivers of inequality, including institutional racism and colonialism.

5 Three scenarios for digital inclusion investment

From the literature, we have learned that community co-design is a key characteristic of successful interventions. It increases trust and motivation in interventions, increasing their adoption and efficacy.

Broadly defined as an approach for involving people in the design of services, strategies, environments, policies and processes that impact them (Mark and Hagen 2020), co-design is increasingly considered to improve outcomes by focusing on the needs of the user.

We wanted to understand how much more benefit could be realised through the incorporation of co-design into an intervention by comparing it to an intervention lacking these elements.

5.1 Scenario 1: Strengthen

Access to a device and the internet is a necessary condition for digital inclusion. This intervention establishes a minimum standard of digital inclusion for households and supports those that are not able to meet the standard by providing the necessary requirements.

We based this intervention on the Connecting Scotland programme, which provided a Chromebook or tablet, unlimited 4G broadband and access to digital skills training to low-income households (Scottish Government 2021).

This scenario builds on current interventions in Aotearoa New Zealand that provide devices, access to broadband and digital skills training. Establishing a nationally coordinated approach with standardised devices and community-based digital skills training would improve the consistency of delivery. Scaling up the delivery could provide a sustained increase in digital inclusion for some targeted households.

We modelled our intervention on the assumption that, in the first year, 10.4% of households do not have the internet, based on Census data and population projections.

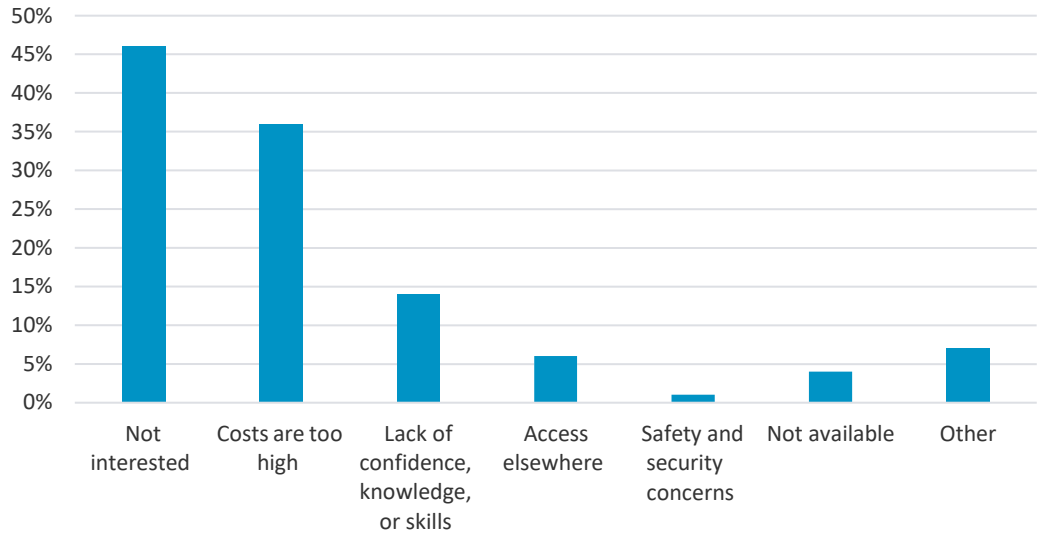
We hypothesised that an intervention without the elements of co-design and delivery would only result in 50% of the people it targets realising its full benefits. The remaining 50% may realise some of the benefits but not all. We have not included these partial benefits in our calculation.

Our hypothesis is based on the Household Use of Information Technology and Communication Technology (HUICT) 2012 survey findings in which 36% do not have internet because costs are too high and 14% do not due to lack of confidence, knowledge or skills (Figure 7).

Given that this intervention addresses these two barriers, we use 50% as an estimate for the proportion of people who will realise full benefit.

We calculated that this kind of intervention (with no co-design) would cost $1 billion and deliver $2 billion in benefits over 10 years – a net benefit of $1 billion.

Figure 7 Reasons households do not have internet access (2012)



Source: HUICT 2012, Stats NZ

5.2 Scenario 2: Empower

Digital inclusion can be enabling and empowering when communities are able to leverage digital technology to meet their aspirations and needs (PeopleForPeople 2021).This package is designed to empower communities to use digital technology and digital skills in ways they value to increase social, cultural and economic wellbeing.

Co-design has been identified as core to developing successful digital inclusion interventions (New Zealand Government 2021). Digital inclusion interventions that enable and empower are effective when co-designed and delivered with and by communities and integrated with other place-based community-led interventions. Models of co-design in Aotearoa New Zealand can be used to develop whānau or community-led interventions, drawing on the learning from international community-based interventions if required (Mark and Hagen 2020; Auckland Co-design Lab 2021).

The initial context will require a co-design situation where the system works with communities to develop localised interventions – these do not just include Māori communities. Co-designed digital inclusion interventions are likely to vary from place to place depending on the priorities of communities engaged with these initiatives. There are diverse views on how to engage with and leverage digital technology, which has the potential to generate exciting opportunities and outcomes for those involved. The government's ability to leverage these opportunities to drive better community-level value and outcomes will be critical to the success of any co-designed digital inclusion intervention.

In many instances, the communities that require digital inclusion interventions will have Māori at their centre, and this is where the consideration of an appropriate Māori-Crown co-design model is required. As highlighted in earlier sections, what this means from a co-design perspective in Aotearoa is that interventions will need to embed a form of parallel thinking where both Māori and Western knowledge bases are acknowledged and the best of both knowledge bases are woven together in a way that empowers communities and addresses localised barriers.

The HUICT 2012 survey found that 25% of people did not have internet due to lack of interest. We hypothesised that increasing community buy-in and understanding of the value of the internet using co-design and co-delivery models would convert this 25% of people into seeing the value of the internet and thus engaging in and realising the full benefit of the intervention.

We hypothesised that, on top of the 50% of targeted people who would participate without the inclusion of co-design, a further 25% would engage if these elements are included, representing a change of 50% in terms of intervention efficacy. This estimation may seem overly optimistic. However, some people outside the 75% will realise partial benefits that have not been included in the calculation. Therefore, we believe an average of 75% is a reasonable estimation.

We calculated that this intervention, with co-design, is likely to deliver $3 billion in benefits at approximately the same cost of $1 billion – a net benefit of $2 billion. We expect the costs will remain similar as an intervention that does not use co-design because the inclusion of co-design will likely result in a more targeted delivery of the intervention to those who are receptive and minimise waste by providing devices and connections only where they are used.

We found that, by including co-design to improve the uptake of an intervention targeting New Zealand's under-included population, we could potentially increase the efficacy of that intervention by 50% (50% to 75% realising the full benefits), with a net benefit increase of 100% ($1 billion to $2 billion).

5.3 Scenario 3: Transform

Neither of the first two intervention scenarios consider the context of digital transformation in New Zealand. Digital transformation can be defined as the integration of digital technology into areas of business, government agencies or the economy in ways that fundamentally change the way they operate (Ministry of Business, Innovation & Employment 2019). National digital transformation programmes, which boost digital skills through advanced training for innovation and productivity, can bring benefits to people and the economy. New Zealand is at a critical point in digital transformation, facing decisions around how to harness digital technology, skills and innovation to see economy-wide benefits. Researchers have made several attempts to estimate the size of the digital transformation prize for New Zealand. AlphaBeta (2021) estimates that, if digital technology is fully leveraged in the economy by 2030, it could add $46.6 billion each year or about 14% of GDP.

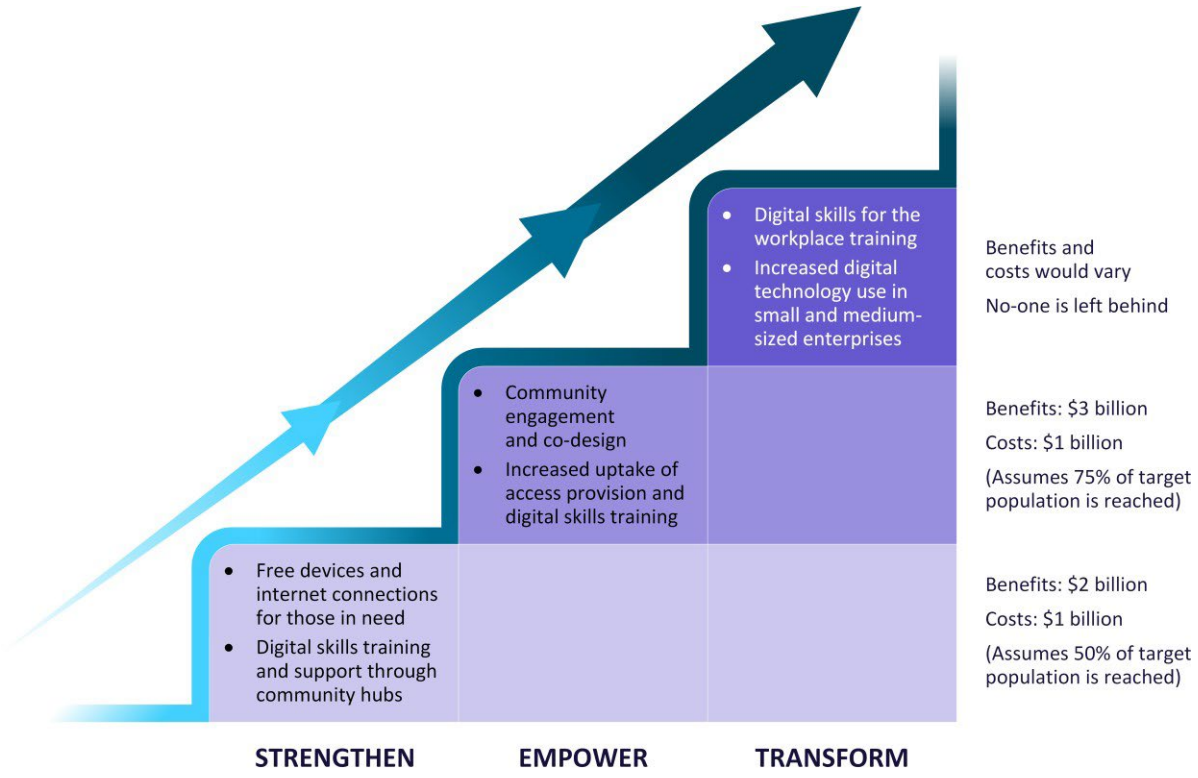
In this scenario, we imagine a digital transformation programme that has digital inclusion at its heart, which would enable the wider benefits to be more fairly distributed. While the scope of digital transformation in New Zealand remains to be seen, we considered that a starting point would build on 'Empower' with the inclusion of advanced skills training and programmes to increase the use of digital technology in SMEs as well as greater access to digital education for young people.

Accelerating the use of digital amongst those who already have access before ensuring everyone has access risks perpetuating inequality. To prevent this, a fast track for the under-included would provide a fairer starting point, followed by steady progress towards transformation.

This intervention combines digital inclusion with the development of a digital-ready workforce that can adapt to technological change across all sectors. It is based on an overarching framework that integrates digital inclusion outcomes with strategies such as the draft Digital Technologies Industry Transformation Plan (Ministry of Business, Innovation & Employment 2022), workforce development plans and the development of vocational education as well as investment in innovation across the business sector.

These three scenarios are summarised in Figure 8.

Figure 8 Three scenarios for digital inclusion



Source: NZIER

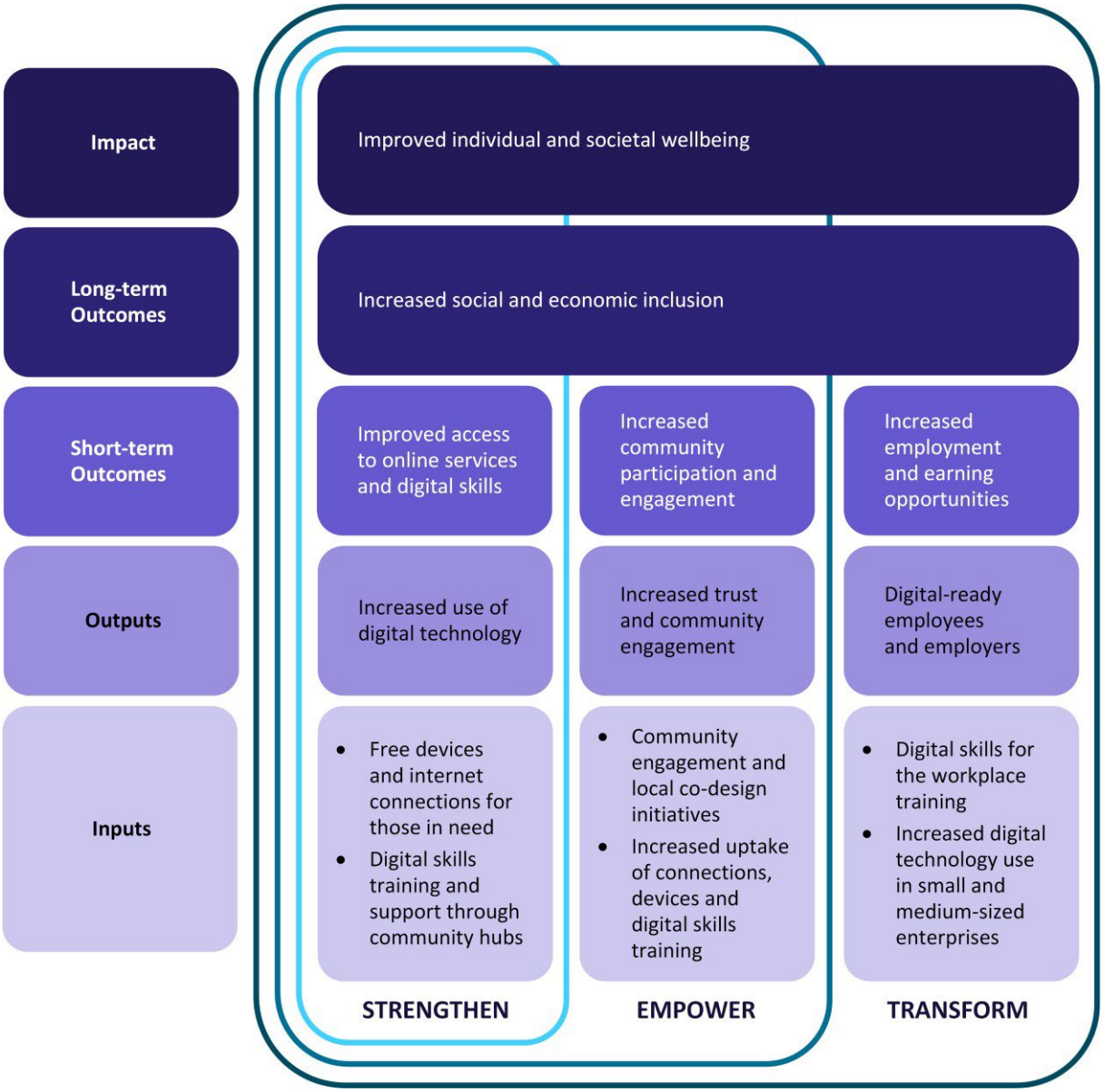
5.4 Ensuring digital transformation leaves no-one behind

Over the past two decades, interventions have had a limited impact on increasing digital inclusion, although this may reflect the rapid pace of technological change.

Evidence suggests that digital inclusion interventions are most successful when designed and implemented at the local level. Interventions that move beyond 'Strengthen' are likely to see the full range of benefits, with community-led interventions seeing both more-efficient spending and sustained outcomes.

Figure 9 shows how each scenario is designed to bring greater social and economic inclusion and wellbeing through increasing uptake of digital access initiatives.

Figure 9 Intervention logic for three levels of digital inclusion scenarios



Source: NZIER

5.5 The costs and benefits of digital inclusion scenarios

In this section, we present estimates of the costs and benefits of investing in digital inclusion. First, we estimate the benefits of the 'Strengthen' scenario over 10 years, applying a discount rate of 6% in line with Treasury standards (The Treasury 2020). We then discuss the additional costs and benefits of the 'Empower' scenario. Tables breaking down the costs and benefits by year are included in Figure 23.

5.6 Scenario 1: Strengthen

Assuming an increasing digital inclusion rate and applying a 6% discount rate, the total benefits over 10 years for this scenario are approximately $2 billion at a cost of approximately $1 billion.

It represents a cost-benefit ratio of 2:1, with $2 in benefits gained for every $1 invested.

Benefits

Table 2 summarises the benefits we include in the calculation. These are not exhaustive benefits but include those that are quantifiable and monetisable. As discussed previously, we assume that, of those who receive the intervention, half engage with digital access and see benefit as a result.

Table 2 Summary of benefits of Scenario 1: Strengthen

Benefit	Description	Estimation
Time saving	Time saving from online government transactions, and online banking	Two government transactions and 26 banking transactions move online each year per household, saving 30 minutes per transaction – each hour saved is $27
Individual earnings	Value of increase in earnings from digital skills	Increase average income ($53,943) of people without the internet who are working by 2.8%
Employment	Increase in employment	Of those unemployed, 21% would look for work, and of these, 5.5% will find a job – assign them the average income for those without internet ($53,943)
Health	Reduction in GP consultations	50% of people reduce their number of GP consultations by one per year, saving $80
Social connection	Greater social connection, reducing loneliness	$2,180 benefit for everyone aged 15 and over
Retail transactions	Savings from shopping online	Assume saving of $952 per year per household (Lloyds 2021)
Government transactions	Savings to government from online services	Two government transactions save $13 each per household
Disbenefit: cybercrime	Cost to households of victimisation from online scams and fraud	-$22 per household

Source: NZIER

Time saving

We assumed that, for each household that moves online, two government transactions per year and 26 banking transactions per year moved online. We followed Cebr (2018) in allocating 30 minutes in time saved per transaction moved online and applied the New Zealand Treasury's value in the Living Standards Framework of 1 hour at $27. This amounted to a saving of $38 million in the first year or $190 million over 10 years.

Individual earnings

We applied a 2.8% increase in average income for people who are employed and engage with internet access in line with Cebr (2018), which matches OECD recommendations. In New Zealand, 54% of people without the internet aged 16–69 are employed. Using the baseline average income of $53,943 in this category, we allocated $1,510 to 54% of people aged 15–69 who engaged with new internet access. This amounted to $95 million in the first year or $370 million over 10 years.

Employment

We use Cebr (2018) estimates to assume that, of those unemployed, 21% would look for work. Of these, 5.5% would find a job. We assigned this proportion of the unemployed who would receive this intervention the average income for those without internet ($53,943). This amounted to $33 million in the first year and $130 million over 10 years.

Health

Unlike previous studies, we did not include the saving of booking online health consultations. In New Zealand, online booking is not universally available as it is under the UK's National Health Service. However, the use of the internet to access health and medical information is likely to reduce demand for GP appointments, representing a saving.

This can occur in two ways – through better health because of better timely and accessible information and through reduced unnecessary appointments. Based on the average number of GP visits in New Zealand (Baldwin et al. 2019) and the assumption that 50% of people who engage with new online access reduce their number of GP consultations by one per year, saving $80 (Smith and Davies 2020), the benefit in the first year is $8 million and $38 million over 10 years.

Social connection

We drew on research that showed that a 1-point increase in internet use (on a 3-point scale) caused a 0.15-point decrease in loneliness scores, also on a 3-point scale (Cotten, Anderson, and McCullough 2013). Smith and Davies (2020) used the New Zealand General Social Survey to obtain monetary estimates for wellbeing outcomes. The researchers estimated that a 1-point change in loneliness on a 0–5 scale is worth $7,267.

Assuming internet access shifts loneliness by 0.3 points, we allocated a benefit of $2,180 to 50% of everyone aged 15 and over who received this intervention scenario. In the first year, the benefit is $180 million and $830 million over 10 years.

Retail transactions

We drew from Lloyds Consumer Digital Index and assumed saving of $952 per year per household for households who engaged with new internet access as a result of this intervention (Lloyds Bank 2021). This amounted to benefits of $95 million in the first year and $480 million over 10 years.

Government transactions

We assumed that government saves from two transactions moving online per household who engage with new internet access because of this intervention at a benefit of $13 per transaction. This is estimated using averages of costs to government for different contact methods in Australia (Deloitte 2015). This amounts to benefits of $3 million in the first year and $13 million over 10 years.

Cybercrime

CERT NZ reports that online scams and fraud cost people $4.2 million per quarter or $16.8 million per year (CERT NZ 2021). This is equivalent to $11 per online household. However, we expect the likelihood of being a victim of an online scam is greater for those who are newly online. We allocate $22 per household that moves online because of this intervention.

Costs

The cost of Scenario 1 includes the cost of providing a device and internet connection per household as well as training in digital skills and technical support. In total, we estimate the cost of this package is $200 million in the first year and $1 billion over 10 years.

Table 3 Summary of costs of Scenario 1: Strengthen

Cost	Description	Estimation
Devices	Cost of supplying a Chromebook or tablet to everyone age 15+	$400 per person over 5 years or $80 per person per year
Internet connection	Cost of connecting all homes to the internet	$660 per household per year
Digital skills	Cost of basic digital skills training and technical support	$132 per person per year

Source: NZIER

Devices

We assumed a cost of $400 per person over 5 years, which is equivalent to $80 per person per year. This estimate is based on median prices for Chromebooks and tablets in New Zealand.

Internet connection

We estimated the cost of Vodafone 4G unlimited broadband at $55 per month or $660 per year for a household.

Digital skills

We estimated digital skills training to cost $132 per person. This estimate is based on government funding for seniors digital literacy training, which saw $600,000 allocated to train up to 4,700 older people (Office for Seniors 2021).

5.6.1 Scenario 2: Empower

Assuming an increasing digital inclusion rate and applying a 6% discount rate, the total benefits over 10 years for this package are approximately $3 billion at a cost of approximately $1 billion.

The represents a cost-benefit ratio of 3:1, with $3 in benefits gained for every $1 invested.

This similarity in costs to Scenario 1 occurs because spending on providing access, connections and community hubs is reallocated towards community funding, so only those who will realise the benefits have allocated costs.

Benefits

The key difference between the 'Strengthen' and 'Empower' packages is the addition of locally co-designed initiatives that bring value to their communities through targeted action. The main additional benefits are an increase in uptake through this co-design approach, which is likely to see more long-term gains as well as network benefits as the gains are passed on. As a tool for estimation, we assume that this 'Empower' package brings benefits to 75% of people who engage with the intervention.

Costs

Additional costs above 'Strengthen' include the cost of co-design and implementation of locally developed initiatives. However, in introducing the community engagement process, the cost of devices, internet and skills are all reduced to those who will actually benefit from them. We estimated that an additional cost of $250 per household per year to undertake community engagement processes and understand needs, equivalent to $50 million in the first year, would be sufficient to bring the benefits to 75% of those targeted.

5.6.2 Scenario 3: Transform

While the specific costs and benefits of this intervention package depend on the scale of a digital transformation programme, we can describe how ensuring those who are currently under-included also benefit from digital transformation would prevent the digital divide from widening and bring an even greater productivity boost.

Benefits

Research shows that a 4% growth in technology sector productivity creates $2.7 billion in additional GDP (NZTech 2019). Investment to support innovation in high-tech and other sectors will improve productivity, delivering greater benefits for digital inclusion. By integrating digital inclusion interventions within digital transformation, those currently without internet access will also be able to meaningfully participate in transformation.

At this stage, we cannot estimate the size of the prize for making digital transformation inclusive, given that it depends on the scope of the digital transformation project itself. However, it is likely that integrated digital inclusion will not just reduce inequality but will increase the transformation benefits through greater diversity.

Costs

The biggest cost of integrating digital inclusion within digital transformation is likely to be delayed outcomes for the transformation project. Instead of endless catching up for those who are digitally under-included, an integrated approach requires a more equal starting point – transformation must wait until inclusion is achieved. This may cause delays in the digital transformation but see greater long-term benefit.

6 Summarising the findings and directions for future research

6.1 Research questions and findings

This research increases our understanding of the benefits of digital inclusion in New Zealand, identifies the characteristics of promising interventions and considers the monetary benefits of future investment. In doing so, it provides a rationale and guidance for government investment in digital inclusion.

It answers the following research questions.

6.1.1 What is the value of increasing digital inclusion and why should the government invest in it?

Digital inclusion brings financial and social benefits to people and communities

When digitally included, people can use the internet in any way they choose – a form of mana motuhake or self-determination that can help people open doors to new opportunities. Different groups experience different benefits, and these benefits can occur at both the individual and community level.

Digital inclusion can:

- positively impact people's earnings and employability, from enabling them to find new jobs to undertaking professional development
- reduce loneliness by helping people and communities stay connected
- make people's lives easier through digital services, internet shopping and increasingly hybrid ways of working
- meet people's informational and education needs (both during and beyond formal schooling situations) and broaden their horizons
- make people feel more empowered and independent.

Since digital inclusion affects access to information, government services, recreation activities and social engagement, digital inequality can contribute to inequality in social inclusion and wellbeing. Those with internet access tend to have higher wellbeing and richer social capital outcomes (for example, voting) than those without access (Grimes and White 2019).

Digital inclusion contributes to the economy

Digital inclusion has benefits for the whole economy through higher employment, higher tax revenue, accelerating productivity and innovation, and GDP growth. Evidence from the UK suggests that the benefits to businesses of employees gaining basic digital skills was worth £1.5 billion over 10 years. In New Zealand, researchers found an increase of 7–10% in firm productivity from adoption of broadband by the firm (Grimes et al. 2009).

Internet access particularly benefits small and medium-sized enterprises by providing access to the global marketplace, which is especially critical in the Aotearoa New Zealand context. The internet also offers logistical support, office automation and cloud computing tools to increase efficiency in smaller workplaces.

Digitally included New Zealanders place a high value on online services
We surveyed New Zealanders to find out how much they valued seven online services: internet searches, email, online shopping, online maps, social media, online music and online video. The survey was designed to understand how much financial compensation people would need to give up these services using a series of trade-off questions in which the participant selects a preference in a hypothetical situation. For example, they may choose between a year without access to online maps and receiving $1,000 or keeping access to online maps and receiving no money.

We found participants would need $1,700–3,500 to give up specific online services for 1 year. With a median individual weekly income of $1,093 in 2021, this means participants valued these services as being worth 2–3 weeks of median income per year (Stats NZ 2021a).

6.1.2 Who is at most risk of digital exclusion in Aotearoa New Zealand?

People without internet access are likely to experience other disadvantages
These disadvantages both contribute to and compound their levels of digital under-inclusion.

Some population groups are less likely to have access to the internet at home
The data shows that people without home internet largely fall into two groups. Those in single-person households without internet are more likely to be older and New Zealand European and have roughly the same income as their counterparts with home internet. Those in multi-person households without the internet are more likely to be Pacific peoples or Māori in crowded households and have lower income.

Other (in some cases, overlapping) groups that are at risk of digital under-inclusion include:

- people living in social housing and those with low housing stability
- disabled people
- unemployed people and those not actively seeking work
- people living in rural locations
- migrants and refugees with English as a second language
- offenders and ex-offenders
- people with low literacy levels
- people with mental health conditions.

The untapped benefits for Pacific peoples, Māori and low-income households are significant – particularly for rangatahi
Nearly a quarter of Pacific peoples are without the internet in the home – three times the rate for New Zealand Europeans and almost twice the rate for Māori. Māori and Pacific peoples are particularly over-represented amongst younger people without internet access. This suggests there is untapped potential for these groups of young people to see increased earnings and employment benefits over a lifetime.

6.1.3 What are the key characteristics of and barriers to successful digital inclusion interventions?

Despite limited robust evidence for what works in digital inclusion interventions internationally and here in Aotearoa, we identified the following key themes:

- **Interventions are most effective when access to devices is combined with digital skills and technical support.** Currently, many interventions focus on providing access to devices and internet connections. However, ongoing access to technical support and digital skills training is also important.
- **Strategic oversight with consistent standards, outcomes and goals is important.** However, approaches to digital inclusion intervention, both in New Zealand and internationally, are fragmented with little agreement or consistency on standards, outcomes and goals across regions and organisations. Due to budget or time limits, the impact of interventions is often left unmeasured.
- **Interventions led by communities' needs and aspirations are more successful.** These co-designed interventions tend to include community leaders in the intervention design and implementation, which reflects communities' needs and aspirations. This characteristic has particular resonance in the Aotearoa New Zealand context, underlining the need to strengthen the Crown-Māori relationship and engage in co-design with Māori as well as with other community groups.
- **Organisations leading or facilitating digital inclusion interventions that are trusted by communities are more successful**. Organisations delivering effective interventions tend to be connected to wider social and economic support networks. This is important because digital under-inclusion often occurs with other specific needs. Co-location of physical community digital hubs with other social service organisations provides the opportunity for more-holistic support, including cross-referral.
- **Community centres that provide non-digital ways to access services continue to be essential.** These centres can provide the most support if they have devices and internet access for public use and provide non-digital ways to access services, including in-person assistance. However, they do not necessarily address the digital accessibility needs of disabled people, who may benefit more from access to specialist equipment – again highlighting the importance of co-design with communities to ensure solutions meet their needs.

6.1.4 How can we optimise investment in digital inclusion interventions?

Our research shows that providing internet, devices and skills training can increase digital inclusion. However, as evidenced in our scenario analysis, the real gains emerge when community engagement and co-design are integrated into interventions. These types of interventions are likely to reach more people, with longer-lasting effects, and at a similar cost.

It is tempting to want to look forward and focus on investing in digital economic transformation through supporting businesses and providing advanced digital skills training. However, this research argues that growing digital inclusion is an essential foundation for economic transformation. Investing in the latter without placing equivalent or greater focus on the former risks deepening the digital divide, negatively affecting the excluded and broader societal wellbeing and limiting economic benefits.

In New Zealand, our national data collection, monitoring and evaluation of digital inclusion metrics is not yet fit for purpose. To continue to optimise investment in interventions, we need better data on digital inclusion, indicator monitoring and evidence on the effectiveness of interventions. There is a need for meaningful metrics, going beyond internet in the home to understanding digital skills, confidence using them and trust in online environments as well as understanding the scale of online harms.

6.1.5 What are the risks of digital transformation without digital inclusion?

Having identified what works to increase digital inclusion and the potential benefits, we developed three scenarios to support future decisions about digital inclusion in New Zealand. The first two scenarios are designed to demonstrate the potential size of the gains when interventions integrate co-design compared to when they do not. The third scenario considers the separate policy objective of digital transformation and demonstrates that, without integrating digital inclusion, it risks increasing the digital divide.

6.2 Directions for future research

We see three interconnected potential directions for future research on digital inclusion.

6.2.1 Kaupapa Māori-led research design and practice

The research benefited from engagement with Māori, but while we have considered New Zealand's unique context throughout, particularly regarding scenario co-design, the research practices, tools and analytical approaches adopted were predominantly Western. Further research based on kaupapa Māori research principles needs to be undertaken for the Māori voice to be 'heard' and to fully understand the disproportionate impact that digital inclusion has on Māori. Such research will need to embed consideration of the 3 Cs and 3Ds into research design and practice. Such an approach will help overcome the limitations of these economic analyses and surveys when it comes to considering te ao Māori, surfacing the Māori voice and sufficiently considering intergenerational benefits.

6.2.2 Building on better data and evaluation

Investment in the generation of better data on digital inclusion, indicator monitoring and evidence on the effectiveness of interventions will provide a stronger foundation for future research to build upon and leverage. This could take the form of additional Census or General Social Survey questions or the introduction of a specific survey akin to the Australian Digital Inclusion Index. It should also include the design and funding for the implementation of robust evaluation frameworks for all major digital inclusion interventions. There is a specific need for an increase in ongoing evaluation to track benefits and efficacy over time.

6.2.3 Getting the most out of co-design

Building on the previous two points, there is an opportunity for future research to help identify successful models for co-design and co-delivery in the Aotearoa New Zealand context. A more detailed understanding of what works, what doesn't and best practice, from general principles through to detailed operating models and processes, could be used to develop templates and guidance to support future interventions.

Appendix A Understanding digital inclusion in New Zealand

This section summarises existing literature that helps us understand the nature of digital inclusion in New Zealand. This literature scan includes defining digital inclusion and the barriers and identifying who is most at risk of under-inclusion. We also explore the nuances of the barriers to digital inclusion faced by the groups most likely to be under-included.

A.1 Search terms and phrases

We began our scan using the following terms and phrases: 'digital inclusion', 'digital exclusion', 'benefits', 'economics', 'skills', 'internet access', 'data literacy', 'digital divide', 'economic impact', 'digital inequality, 'cost-benefit analysis', 'internet poverty'. We included other terms as our search progressed.

We searched databases including the Econlit, Ebsco and Proquest research databases. We also searched the internet using Google and Google Scholar. We gathered additional material by scanning reference lists of publications obtained and received material from the Digital Council for Aotearoa, the Department of Internal Affairs and other stakeholders.

A.2 Defining digital inclusion

The MBIE-commissioned report *Digital New Zealanders: The Pulse of Our Nation* recommended that New Zealand adopt the term 'digital inclusion' due to its prevalence in international literature. They suggested a definition of digital inclusion as:

> *… someone who has access to affordable and accessible digital devices and services at a time and place convenient to them, as well as the motivation, skills, and trust to use the internet to pursue and realise meaningful social and economic outcomes*. (Digital Inclusion Research Group 2017, 5)

The *Digital Inclusion Blueprint*, which lays out the Government's vision for digital inclusion in New Zealand, defined digital inclusion as

> *… having convenient access to, and the ability to use confidently, the internet through devices such as computers, smartphones and tablets*. (DIA 2019, 7)

Due to the rapid advancement of digital technologies, the DIA noted that this definition can evolve over time. At a broad level, being digitally included means using digital technologies as part of everyday life safely and securely.

Since the publication of the *Digital Inclusion Blueprint* and *Digital New Zealanders* report, the literature in New Zealand and internationally has expanded on the concept of digital inclusion to go beyond the starting points of motivation, access, skills and trust towards a richer understanding of the barriers to digital inclusion. Given that digital inclusion involves behaviour, we applied the flexible COM-B framework as a starting point for understanding the barriers to digital inclusion (Michie, van Stralen and West 2011). Within this framework, we consider someone to be digitally included if they have the capability, opportunity and motivation to use the internet to pursue and realise meaningful social and economic outcomes. Within these categories, we consider motivation, access, skills and trust alongside other barriers and the interactions between them.

A.2.1 Capability

Capability refers to whether a person has the knowledge, skills, and abilities required to make full use of the internet. The two components of capability are:

- psychological capability – knowledge, skills and psychological strength
- physical capability – physical strength and skills.

Psychological capability

A major component of psychological capability is the ability to use the technology. People can sit on a spectrum of ability levels ranging from basic (for example, using a smartphone) to highly advanced (for example, specialist coding skills). The level of inclusion a person feels depends on their technological needs relative to their skills. A person can be digitally included if, for example, a smartphone is sufficient for their online activity. However, they may become less included if they have a need to complete online forms or write a CV. As more services move online and technology develops, people may need to learn new digital skills to maintain a basic level of access. One important skill for keeping up with changes is concerned with installing devices and software and troubleshooting problems.

Physical capability

For some, there are physical barriers to making full use of the internet. Some disabled people may have specific needs for accessing the internet, which come at extra cost or are not widely available. Hardware, software and website interfaces can be poorly designed for those with specific needs or who use accessibility tools with the internet. Such designs can be an additional barrier for making full use of the internet. At the same time, disabled people are likely to see especially fruitful benefits of being online. For example, a person with a visual impairment can benefit from using text-to-speech technology. However, through poverty, lack of social support or other reasons, disabled people are more likely to be digitally under-included (Chadwick and Wesson 2016).

A.2.2 Opportunity

The two components of opportunity are:

- physical opportunity – opportunities provided by the environment such as time, location and resource
- social opportunity – social opportunities like social cues and cultural norms.

Physical opportunity

The biggest physical opportunity barrier is simply having access to an internet connection and device. In 2018, 80% of households had access to the internet (Stats NZ 2018a). The most common barrier for under-included groups is affordability (20/20 Trust 2018). Although the costs of devices and internet connections have decreased in the past decade, connection still requires a significant investment and ongoing weekly cost, disproportionately affecting those on low incomes. These costs can escalate as devices become obsolete and need upgrading. For those living from week to week financially or moving accommodation frequently, rent and groceries take priority over internet access.

Another barrier is the time it takes to learn digital skills. Even when training is freely provided, participants still face costs like transport, childcare or paid work opportunities forgone (Kvasny and Keil 2002).

Social opportunity

Social opportunity is concerned with whether the internet is used by others in a person's social sphere and if it is culturally acceptable to use it. A simple example of social opportunity is whether the majority of one's peers use social media or WhatsApp groups, which can drive use further. Social opportunity is dependent on physical opportunity – in order to join a social norm, a person needs to have a device.

COVID-19 has been a major driver in increasing social opportunity. The move to entirely digital social interaction has seen changes to what is considered socially or culturally acceptable to do online. One example of this was Pacific churches moving online, which connected families, encouraged social media interaction and assisted community members in upskilling or getting connected (Ministry for Pacific Peoples 2021).

A.2.3 Motivation

In the COM-B framework, motivation consists of:

- reflective motivation – beliefs about capabilities and consequences
- automatic motivation – emotions, habits and reinforcement such as rewards and incentives.

Reflective motivation

For some, lack of motivation to get online is tied up in capability and opportunity barriers, while others have a strong preference for staying offline. The lockdowns brought on by COVID-19 were a motivator for many, providing the only way to link with family, whānau, iwi, community groups and churches (Milne 2021).

One barrier for motivation is concern about online safety. Making financial transactions or making one's data accessible comes with a degree of risk. Online scams are on the rise, and many worry about the susceptibility of themselves or others (DIA 2020b; Citizens Advice Bureaux New Zealand 2020). Low trust and negative online experiences encourage some to limit their activities to a narrow range, which can limit the scope of benefits as well as increasing vulnerability to misinformation. Understanding of privacy concerns as a barrier often does not show up in studies of non-adoption because many users adopt the internet by necessity in spite of privacy or surveillance concerns (Gangadharan 2017).

Another barrier to motivation is the potential for social harm online. This harm manifests in many ways. Taking human interaction online amplifies behaviour such as bullying and simultaneously reduces opportunities for physical social interaction. Social media is criticised for promoting harmful content to young people that can encourage dangerous behaviours and damage mental health (Montag et al. 2019). Misinformation, which has seen damaging consequences during COVID-19, is spread through online forums and social media.

Automatic motivation

Many under-included people have low levels of trust in social, cultural, civic and economic institutions more broadly, which informs trust in digital technology and the internet. Māori

data sovereignty – the recognition that Māori data should be subject to Māori governance – is concerned with how Māori data is used and stored (Kukutai and Taylor 2016). Without confidence in appropriate data use, many see potential risk in disclosing information online.

When first using the internet, there are high start-up costs in terms of time and energy. Setting up a computer and learning to navigate the internet, email addresses and file management are cognitively taxing and time-consuming tasks. These start-up costs can prevent the formation of new habits for using the internet.

A.3 The spectrum of digital inclusion

In reviewing definitions of digital inclusion, it is clear that exclusion and inclusion are not binary conditions but are two ends of a spectrum. Some people face complete digital exclusion with no device, no internet access and no skills or capacity to use it. However, many more face under-inclusion. For example, a person may have access to a smartphone but not a computer, which gives access to some online services but not writing documents or filling out forms. Some may have capped wifi at home, limiting access to streaming or video calls.

Meeting the requirements of digital inclusion itself is a moving target as digital technology and its applications evolve (Thomas et al. 2021). Ten years ago, the conditions for full digital inclusion were likely different to those today. Further, attaining digital inclusion is not the end of the journey as it is not a permanent state (Chen 2020). For example, loss of income or housing can reduce access to technology and the ability to use it.

A.4 Te ao Māori and digital inclusion

Kaupapa Māori research considers digital technology and digital inclusion in the context of social, cultural, economic and environmental spheres. In the discussion paper *Pūmau Tonu te Mauri: Living as Māori, now and in the future*, Sir Mason Durie discusses how the connections between cultural elements form the culture as a whole, creating a korowai that enables the separate components to flourish. A solid cultural foundation supports wellness where the whole person is "able to stand tall, engage with others, look to the future and contribute to society" (Durie 2017, 19). Durie observed that digital connections open up avenues for participation on the marae, noting that online attendance at tangihanga was emerging and other hui were held online so whānau overseas could attend. Since 2020, the COVID-19 lockdowns forced these significant cultural events online, providing Māori an essential, albeit imperfect, connection to whānau, hapū and marae encounters (Dawes et al. 2021).

A.4.1 Digital inclusion in Māori health models

In interviews with DIA researchers (DIA 2020b), Māori participants recommended that Durie's Te Whare Tapa Whā model be used as it complements the framing of digital inclusion and can help government to think holistically about wellbeing and mental health in the digital world. Originally developed for understanding Māori health, Te Whare Tapa Whā takes the shape of the wharenui to illustrate the four dimensions of Māori wellbeing – taha tinana (physical health), taha wairua (spiritual health), taha whānau (family health) and taha hinengaro (mental health). Should one of the four dimensions be missing or damaged, a person or a collective may become unbalanced and subsequently unwell.

Durie later developed Te Pae Māhutonga, which brings together additional elements – mauri ora (cultural identity), waiora (physical environment), toiora (healthy lifestyles) and te oranga (participation in society). These four elements take the form of the four central stars of the Southern Cross constellation, while the two pointer stars represent ngā manukura (community leadership) and te mana whakahaere (autonomy) (Durie 1999).

Digital inclusion has increasing roles to play in both Te Whare Tapa Whā and Te Pae Mahutonga. Particularly following COVID-19, internet access contributes to taha whānau by allowing whānau to connect, taha hinengaro by providing access to services and community and te oranga by enabling participation in society. For some, the internet has a part to play in mauri ora by enabling participation on the marae.

A.5 New Zealand's place in the world

Several indexes measure digital inclusion internationally. Here, we summarise New Zealand's standing according to the Inclusive Internet Index, the World Internet Project and the OECD's Going Digital Toolkit.

A.5.1 Inclusive Internet Index

The Economist Intelligence Unit (EIU), commissioned by Facebook, has run the Inclusive Internet Index annually since 2017. The index assesses countries on "the ability of their citizens to use the Internet for personally and socially enriching purposes" (Economist Intelligence Unit n.d.). The index ranks 120 countries across four domains:

- **Availability** – quality and breadth of available infrastructure required for access and levels of internet usage.
- **Affordability** – the cost of access relative to income and the level of competition in the internet marketplace.
- **Relevance** – the existence and extent of local language content and relevant content.
- **Readiness** – the capacity to access the internet, including skills, cultural acceptance and supporting policy.

In the 2021 rankings, New Zealand was in joint sixth place with Canada and France. The EIU notes that New Zealand fell from third place in 2020 due to a decline in "readiness" owing to weakened trust in online privacy, non-government websites and apps, and social media. "Relevance" also deteriorated due to the under-use of e-health, e-finance, e-commerce and e-entertainment. This ranking suggests that, relative to other countries, some online services are under-provided in New Zealand.

A.5.2 World Internet Project

The World Internet Project is an international survey on internet availability and use. In the 2021 iteration of the survey in New Zealand, 94% of New Zealand respondents were current internet users, which is the same as in 2019 (Diaz Andrade et al. 2021; Cole et al. 2019). By age, those 65+ were the lowest internet-using group at 84%. The last international comparison report from the World Internet Project was in 2019, so a cross-country update following COVID-19 is still in the pipeline.

A.5.3 Going Digital Toolkit

The OECD's "Going Digital Toolkit" tracks 33 indicators spanning seven policy dimensions: access, use, innovation, jobs, society, trust and market openness (OECD 2019). According to the toolkit, New Zealand's best-performing indicators were "small firms selling online" and "adults proficient in problem-solving with technology", but indicators were lagging on "ICT patents" and "public sector spending on active labour market policies".

A.5.4 Country-specific indexes

Aside from international indexes, some countries have developed their own indexes to monitor digital inclusion. Meyerhoff Nielsen et al. (2019) propose that measuring digital inclusion within a country requires capturing data related to four key dimensions: access to electricity, the internet, devices and quality of the access; traditional and digital skills, including critical thinking and literacy; use of technology, including digital products and places of access; and a supportive environment that is affordable and trustworthy.

One of the most developed country-level indexes is the Australian Digital Inclusion Index (ADII), which uses an annual survey to capture relevant data across Australia. The ADII tracks internet inclusion across access, affordability and digital ability, providing high levels of detail given the nature of the surveys. This index demonstrates that, while aggregate digital inclusion is improving in Australia, it is still differentiated along geographic, social and socio-economic lines (Thomas et al. 2021).

The UK has been partly driven to monitor its state of digital inclusion due to its 'digital by default' policy. The UK Government adopted this approach in 2014, which aims to make digital services easy to use so they become the first choice for services (Heselwood and Pritchard 2019). The UK Office for National Statistics collates several surveys on internet use, access and time use (Office for National Statistics 2019).

A.5.5 Limits of international indexes

While international measures help us understand the under-performing areas at a national level, they do not capture all the distribution of these benefits (exceptions include the Eurostat ICT survey and DESI, which record income and education attainment). For example, according to the Inclusive Internet Index, New Zealand scores highly on skills when measured as literacy, educational attainment, government support for digital literacy training and government website accessibility. However, the index does not capture who within New Zealand attains these high scores. We know from New Zealand studies that many miss out on digital literacy training opportunities or do not have the skills to make full use of a digital device. For example, a New Zealand-based evaluation of a Computers in Homes (CIH) initiative raises issues with the 2017 New Zealand World Internet Project findings, which estimated that 93% of New Zealanders could access the internet and use the internet once a day or more, but only 80% had an internet connection (Diaz Andrade et al. 2018). The CIH authors recommend that the figure is more like 10–12% of New Zealanders not able to access the internet (20/20 Trust 2018).

A.6 Why are some digitally under-included?

The factors that contribute to under-inclusion are complex and systemic. Being under-included compounds the impact of wider social, cultural and economic factors.

In this section, we draw from interviews and focus groups conducted by DIA in 2021 as well as other sources with groups identified as most at risk of digital under-inclusion: Māori, Pacific peoples, disabled people, refugees, seniors and people living in rural areas.

A.6.1 Māori

Māori experiences on the spectrum of digital inclusion are diverse (Aiko Consultants 2020). In interviews with DIA, some identify that digital inclusion brings important social, economic and education-related benefits. Specifically, the internet helps people and communities to learn, communicate, access cultural information, work and do business, carry out cultural practices and do business on marae. At the same time, some raise concerns that taking culture online will harm important cultural traditions. Durie (2017) suggests there are both positives and negatives for Māori online:

> *Globalisation will threaten Māori participation in te ao Māori in favour of being participants in a global society … On the other hand, retaining an identity that reflects "being Māori" could be enhanced by new technologies and methods of learning that will enable Māori to be just that, no matter where they are in New Zealand or across the world.* (Durie 2017)

Online communication is not a perfect substitute for kanohi-ki-te-kanohi (face-to-face) interaction, which forms connections and establishes relationships. Several researchers document a preference for in-person interaction in a health context (Kerr et al. 2010; Hudson et al. 2010; Mane 2009).

Trust

In the *Digital Inclusion Blueprint*, trust is concerned with "trusting in the internet and online services; and having the digital literacy to manage personal information and understand and avoid scams, harmful communication and misleading information" (DIA 2019, 10). For Māori, the whakapapa of distrust towards digital issues is rooted in a broader distrust of the systems in which digital issues are embedded (West et al. 2020). Historically, over-surveillance of Māori and a system riddled with inequality-increasing issues (for example, the 2018 Census) manifests greater distrust. This has wider implications for how Māori view government decisions, policy and processes relating to increasing digital inclusion.

Data sovereignty an additional barrier

The DIA focus group found that Māori organisational leaders expressed concerns about data security and data storage:

> *Some leaders were concerned about a loss of control of iwi data stored overseas and wanted more control over how and where data was stored. Others worried about data loss due to hacking or poor cybersecurity. Others simply wanted to know more about the opportunities and pitfalls and to have the knowledge and skills to make their own decisions about how and where to store iwi data.* (DIA 2020b)

Intergenerational digital skills

Māori interviewed for the DIA research identified the importance of digital skills for learning and work. They also noted that some teachers lacked digital skills and this was especially apparent during lockdowns. As in other groups at risk of digital under-inclusion, the interviews found that many kaumātua (as well as older adults) relied on the younger

generations in their whānau to teach them digital skills and that many kaumātua were motivated by the desire to engage with their mokopuna.

A.6.2 Pacific peoples

Pacific peoples' experience of digital technology and use of the internet in Aotearoa New Zealand is also diverse. For this section, we acknowledge work already done by Digifale, a Pacific intergenerational programme that aims to improve digital health equity through providing access, connection and skills to collate resources related to Pacific communities and digital inclusion.

Digital mindsets

PeopleforPeople (2021) conducted research into how a "digital mindset" for Māori and Pacific peoples plays a role in the digital divide and how other barriers add to this. The authors define a digital mindset as the "established set of attitudes in relation tothe digital world". The authors note that the value and potential opportunity from technology needs to be better communicated to help foster confident mindsets.

Successful programmes to encourage digital engagement in Pacific communities have started by helping participants to identify an entry point such as access to online church services that addresses cultural or spiritual needs. Having experience using a digital device, usually a mobile phone, people can then explore other uses (DIA 2021b). However, while the skills needed to use social media are relevant for other uses, PeopleForPeople (2021) found that many using these platforms still believed they were not digitallyliterate.

Locked out by high costs

Pacific peoples are more likely to live in low-income households, meaning the cost of devices and connections takes up a larger proportion of income (Ministry for Pacific Peoples 2020). Smartphones can provide access to much the internet has to offer including a range of government services, but the larger screens and keyboards of laptops or desktop computers enable access to documents, work and education online.

Institutional concerns

Researchers found that many interviewees expressed low trust in both the online world and in themselves when it comes to using technology safely (DIA 2021b; PeopleforPeople 2021). For example, concerns were raised about discerning legitimate websites from fraudulent ones. Interviewees also raised concerns about the possibilities forcultural appropriation and use of cultural content online without consent.

Low trust in government institutions fosters low trust in digital inclusion initiatives. This low trust is especially prevalent in those communities that do not have access to New Zealand citizenship and were subject to the Dawn Raids in the 1970s (Samoan, Tongan, Fijian and Kiribati).

A.6.3 Disabled people

Disabled people have a diverse range of needs and experiences with digital inclusion. For example, DIA research found one participant who was blind preferred fewer pictures on the internet, while another participant with an intellectual learning disability said that having a lot of picture cues was helpful (DIA 2020a). Digital technology has the potential to enable

access to services, education and work opportunities as well as benefits from social connections and access to information.

Assistive technology can price many out

Technology that is suited to the specific needs of the user is essential for digital inclusion, but this technology can be less affordable. Disabled people are more likely to have lower incomes and poorer housing security, making accessible devices even less attainable (Stats NZ 2020). Further, even with the best technology, digital accessibility relies on websites and services to be designed and set up for such technology. Websites may be inaccessible through colours, font sizes or incompatibility with screen readers.

Lack of specialist training

Venue accessibility for skills training can prevent people from attending training and benefiting from face-to-face learning that reduces fear and insecurity around scams through education and can build confidence in navigating digital devices alone (Good Things Foundation 2016).

A.6.4 Refugees and migrants with English as a second language

Interviewing refugees and migrants with English as a second language, DIA (2021c) focused on migrants who had been granted visas for humanitarian, relationship or parent reasons. Many of these people also had little or no experience with digital technology and its applications.

Benefits from communicating overseas and government services

There are clear benefits from digital inclusion for refugees and migrants with English as a second language. With family, friends and communities overseas, digital access provides a way to maintain connections and gain information. Further, with many government services offered online, the DIA interviews found that accessing government services was a key driver for getting online.

Language and mental capacity are additional barrier

For many, learning New Zealand's languages is a priority above gaining digital skills. The amount of new information to take on board when moving countries can be overwhelming, leaving little additional mental capacity for extras like digital skills. With most digital skills courses taught in English, technical terms can be difficult to understand. There is potential for online translation services to offer day-to-day benefits, but DIA interviews found they were not robust and were vulnerable to misinterpretation.

A.6.5 Seniors

With 24% of those over 65 in employment in New Zealand (compared to a 15% OECD average), digital skills are key to ongoing participation and meeting demand for a high-skilled workforce (OECD 2021). 16% of those over 65 are non-users of the internet (Diaz Andrade et al. 2021). For seniors, internet access can bring benefits including social participation, connectedness and health and wellbeing.

Digital ceilings

Research by Toi Āria (2019) found that the effects of ageing can impose a ceiling on internet use, whether it is due to physiological changes, the effort involved to keep up with changes,

a fear of scams or preferring other means of communication. The researchers predicted that even 'digital natives' who have grown up with the internet may face the same ceilings upon entering the older age brackets.

Scams and victimisation

Seniors have more trust in institutions but this increases vulnerability to online scams and misinformation (Chapple and Prickett 2019). Some of those who choose not to use the internet have concerns about privacy and personal security, while others who want to use the internet can be sold internet packages above their needs.

A.6.6 Rural communities

Rural communities are at risk of digital under-inclusion primarily because of poor connectivity to digital networks. There is a diversity of experience in rural communities that reflects different social, cultural and economic outcomes, especially for rural Māori.

Evidence for an urban/rural divide is mixed. The World Internet Project NZ (Diaz Andrade et al. 2021) found that "there does not appear to be an urban/rural connectivity divide" based on the proportion of non-users in urban and rural areas (6% and 5% respectively), noting that this did not take into account internet quality or reliability. However, a Federated Farmers survey of rural connectivity found consistent quality connectivity was a continuing problem, with about 20% of respondents reporting a decline in service in the past year, which may be due to increasing numbers of users on networks (Federated Farmers of New Zealand 2021). The survey did identify examples of improved capacity and networks. For example, the number of respondents from Gisborne has increased considerably, likely due to the new Gisborne Net service.

Governments, banks and other service providers are reducing their outlets in rural areas as they move services online. Between September 2019 and September 2020, 84 bank branches and 252 ATMs were closed (Stock 2021). Rural schools may suffer from inconsistent internet access, which may affect learning outcomes as learning resources are increasingly online.

A.7 What does New Zealand data reveal about internet access in the home?

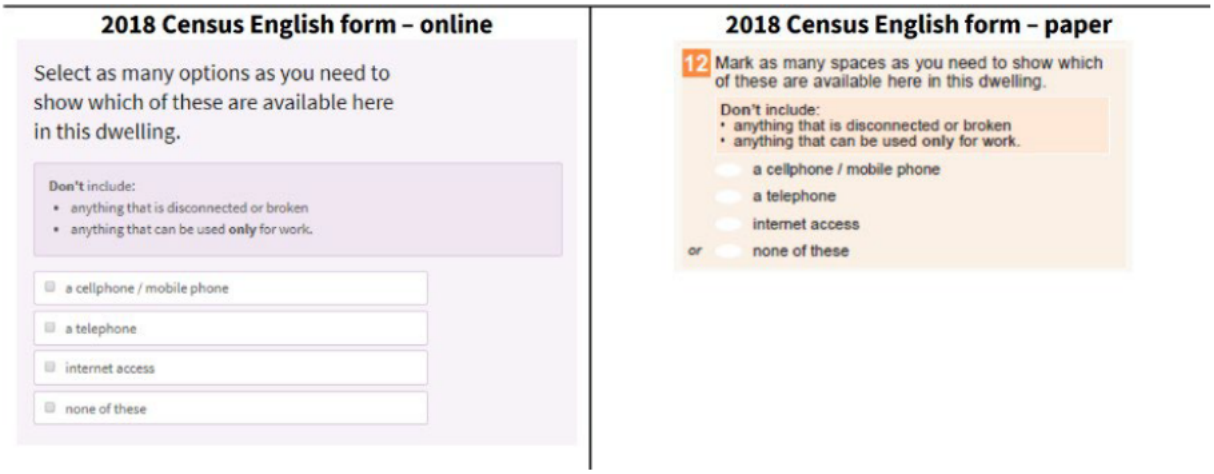
We use New Zealand administrative data to understand the current state of internet access in households.

A.7.1 Digital inclusion indicators in the IDI

2018 Census

The Census contains a question on whether there is internet access in the home. The question and possible responses are detailed in Figure 10. There is one response per dwelling. The respondent states which telecommunication options apply to the dwelling, selecting as many as necessary. The categories are a cellphone/mobile phone, a telephone, internet access or none of these. The respondent is instructed to not include anything disconnected or broken or that can be used only for work.

Figure 10 2018 Census question on internet access



Source: Stats NZ (2018b)

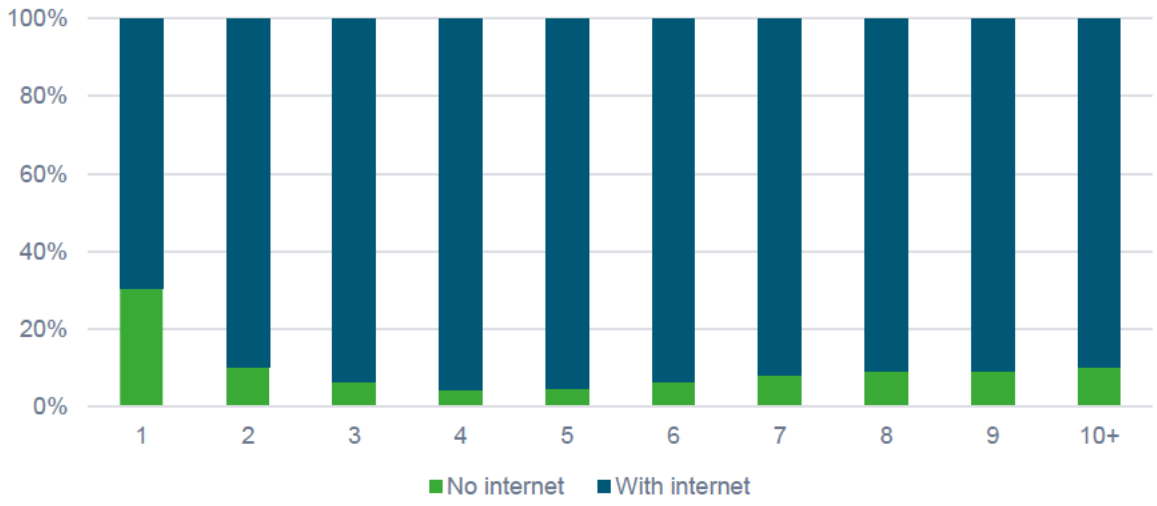
A.7.2 Findings from the 2018 Census: households

The 2018 Census data shows that, overall, 12% of households report not having internet access. In this section, we explore the features of those households.

Household size

Figure 11 shows the proportion of households with internet access by number of people living in the household. 30% of single-person households are without internet access, over double the average of all households.

Figure 11 Internet access, by number of people living in household



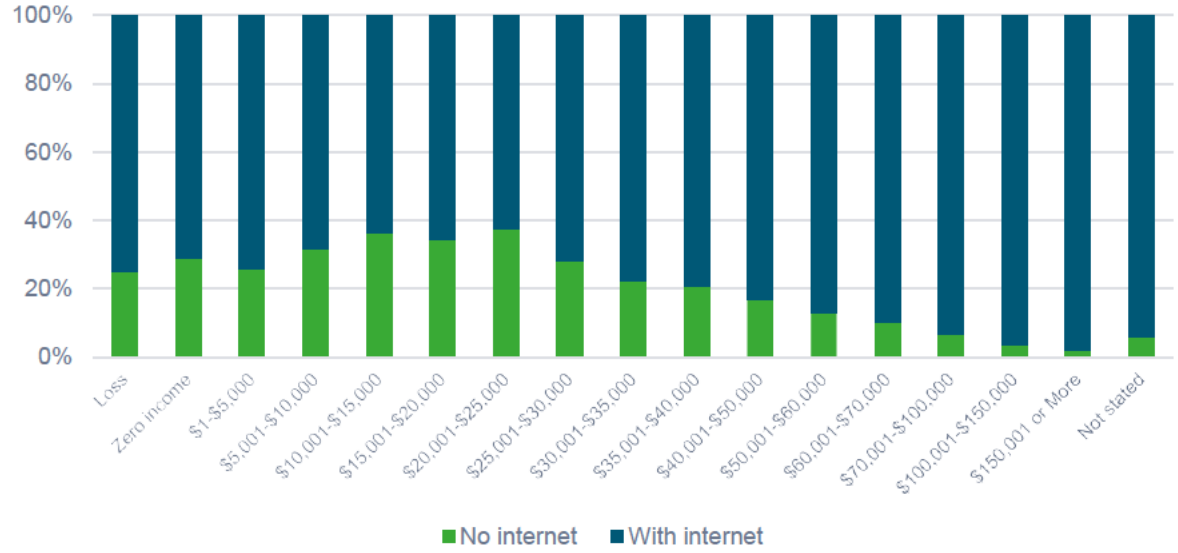
Source: NZIER using Census 2018

Household income

Figure 12 shows the proportion of households without internet access by household income group. These income bands are reported in the Census. Here, we see much higher proportions without internet access in the lower household income ranges. The group least

likely to be without the internet is $20,000–25,000. Given that this may be driven by older people in single-person households, we explore income sources in section Figure 23.

Figure 12 Internet access, by household income

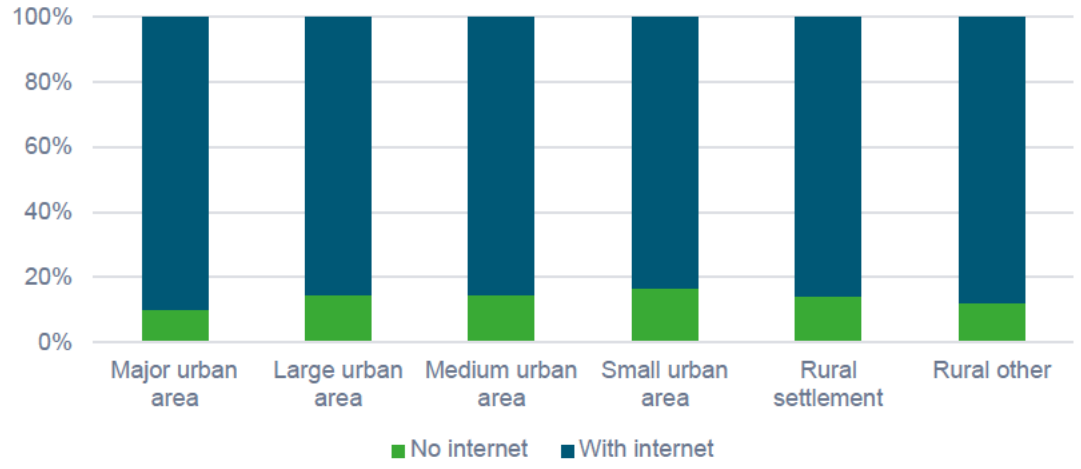


Source: NZIER using Census 2018

Household area type

Figure 13 shows internet access by household area type. Internet access is reasonably evenly distributed across area types. Small urban areas have the highest proportion without internet access at 17%.

Figure 13 Internet access, by household area type



Source: NZIER using Census 2018

Region

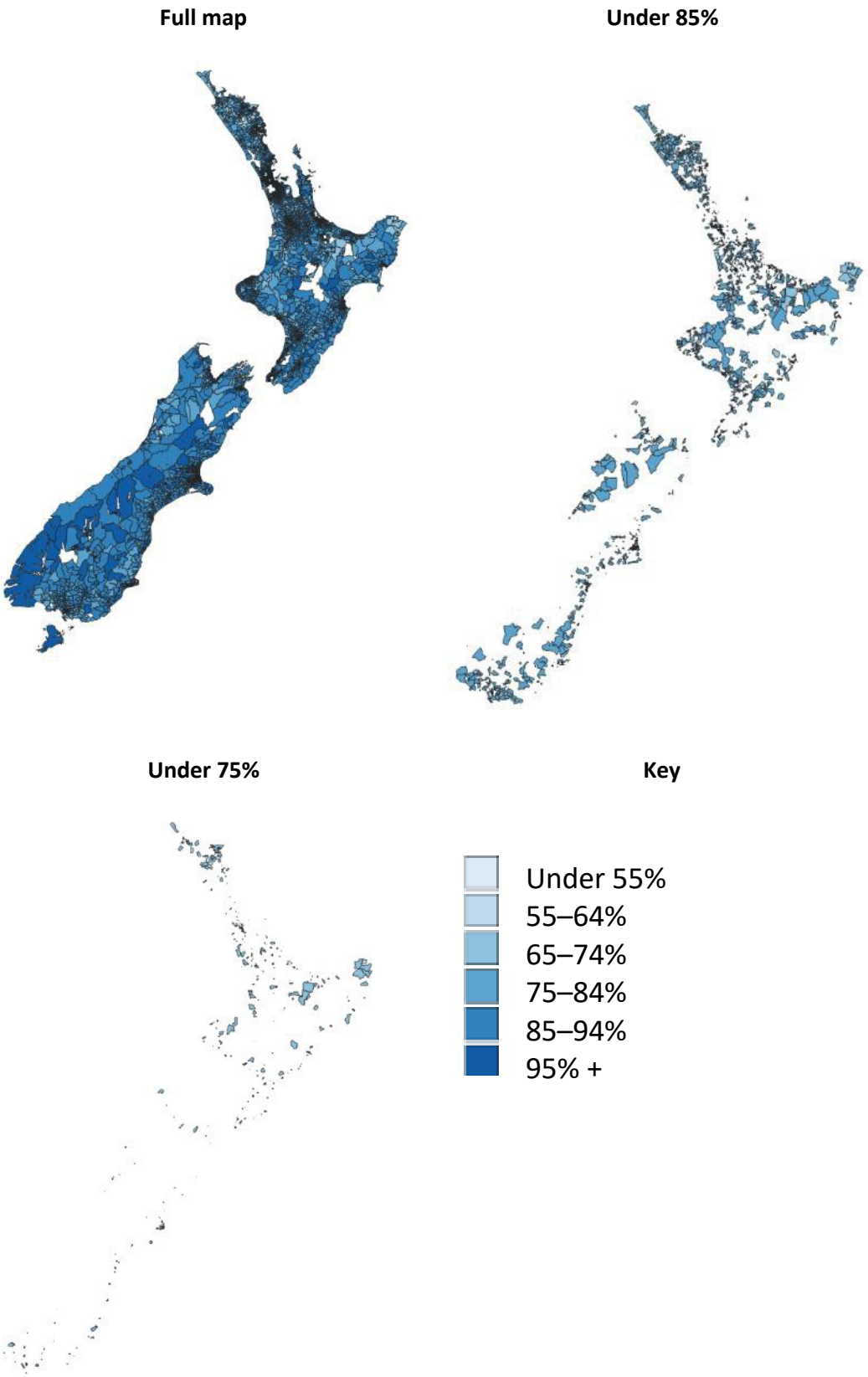
Table 4 shows household internet access by regional council. Here, the West Coast and Gisborne stand out as having the lowest rates. We also plotted internet access by statistical area 1, in which areas have an ideal size range of 100–200 residents and a maximum of about 500. This means that, while areas are of varying sizes, each area has approximately the same resident population. Plotted in this way, we can see that there are pockets throughout the country that are less connected to the internet, even within the regions that are overall the most connected like Auckland and Wellington (Figure 14).

Table 4 Internet access, by region

Region	Households with internet connection
Northland	80%
Auckland	90%
Waikato	84%
Bay of Plenty	85%
Gisborne	78%
Hawke's Bay	83%
Taranaki	82%
Manawatu-Wanganui	81%
Wellington	89%
Tasman	85%
Nelson	87%
Marlborough	84%
West Coast	77%
Canterbury	86%
Otago	86%
Southland	80%

Source: Stats NZ (2018a)

Figure 14 Internet access by statistical area



Source: Stats NZ (2018a)

Crowding

Crowding occurs when the homes that people live in are too small to accommodate the number of people in a household. The measure used by Stats NZ is the Canadian National Occupancy Standard. This measure calculates the number of bedrooms needed based on the demographic composition of the household. It assumes that there should be no more than two people to a bedroom but that couples and children of certain ages can share a bedroom. Under this definition, a household is categorised as:

1 2 or more bedrooms spare

2 1 bedroom spare

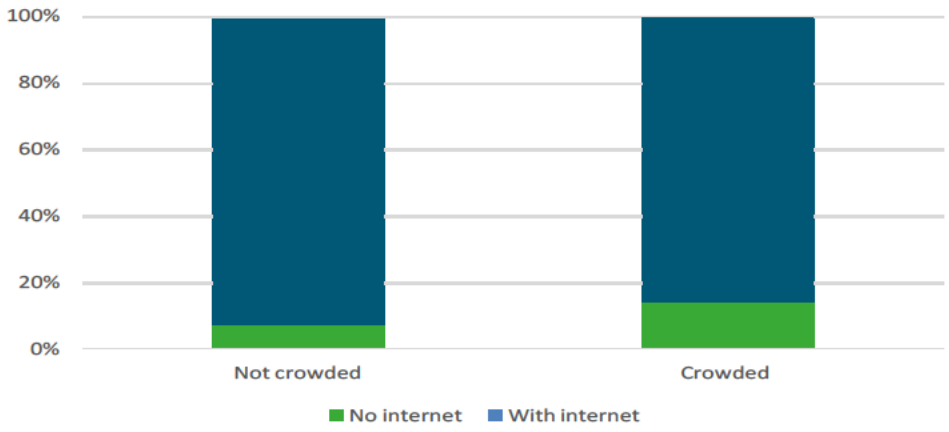
3 No extra bedrooms required

4 1 bedroom needed

5 2+ bedrooms needed

We identify households as 'crowded' if they fall into category 4 or 5. For this analysis, we remove single-person households, which cannot be classified as crowded. After removing these, we see that crowded households are twice as likely to be without internet (14%) as non-crowded households (7%).

Figure 15 Internet access, by household crowding for households greater than one



Source: NZIER using Census 2018

A.7.3 Findings from the 2018 Census: people

We now turn to the features of people living in these households. Overall, 9% of people live in households without internet access.

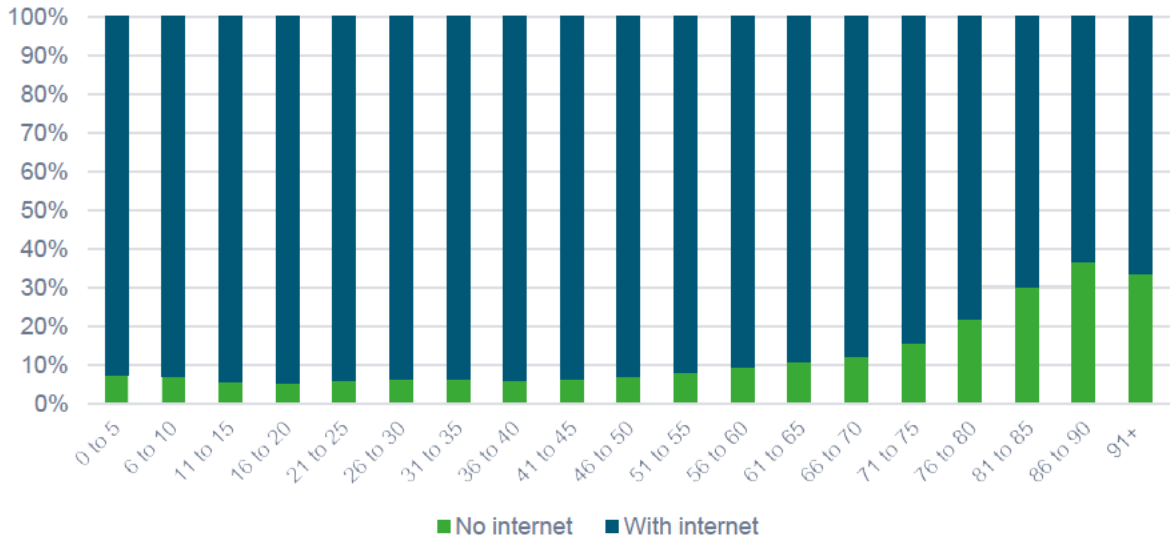
Age and ethnicity

In this section, we report internet access by age, ethnicity and then age stratified by ethnicity due to interaction between the two. Given that Māori and Pacific peoples are younger populations than New Zealand European, simply observing that older people are less likely to have the internet fails to acknowledge the over-representation of Māori and Pacific peoples in households without the internet and would overlook the policy solutions best suited for everyone facing digital under-inclusion.

When reporting results by ethnicity, we include anyone who is identified with the ethnicity reported. Therefore, some people are included across two or more ethnicity groups.

Figure 16 shows internet access by age group. In line with previous research, we see that older people are much more likely to be without the internet at home, reaching a peak of 36% for people aged 86–90.

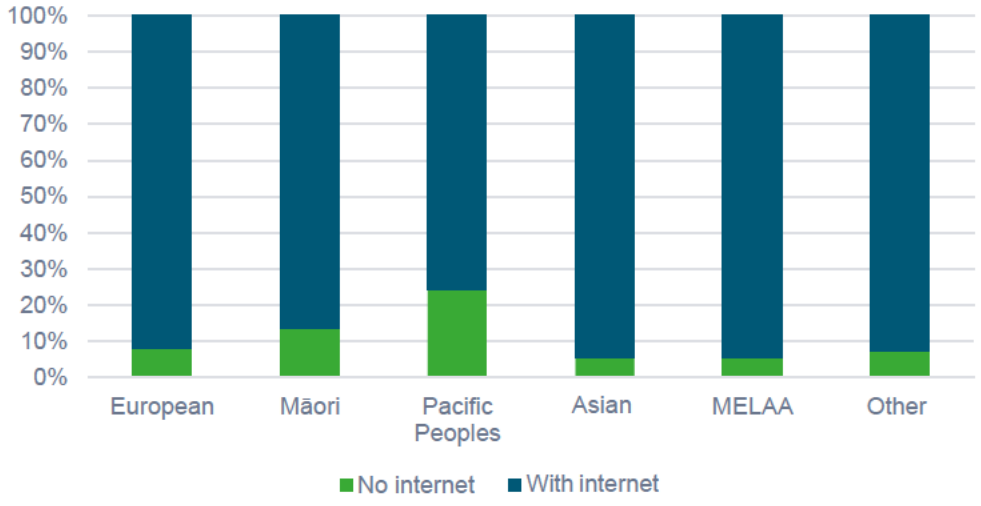
Figure 16 Individual internet access, by age



Source: NZIER using Census 2018

Figure 17 shows internet access by ethnicity groups used by Stats NZ. Māori are above the national average without internet at 14%, and Pacific peoples have the highest incidence of being without internet access at 24%.

Figure 17 Individual internet access, by ethnicity



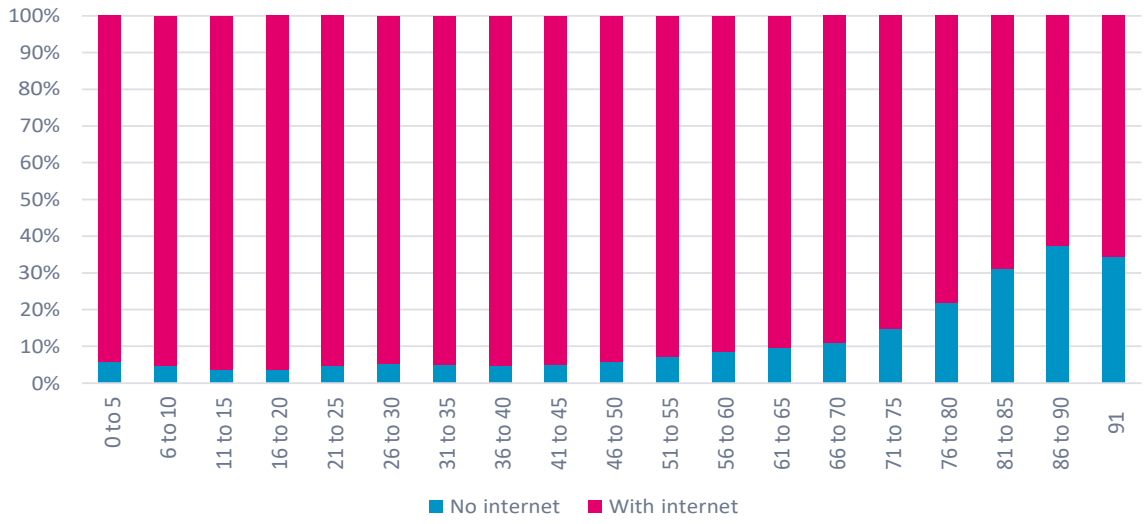
Note: MELAA is Middle Eastern/Latin American/African

Source: NZIER using Census 2018

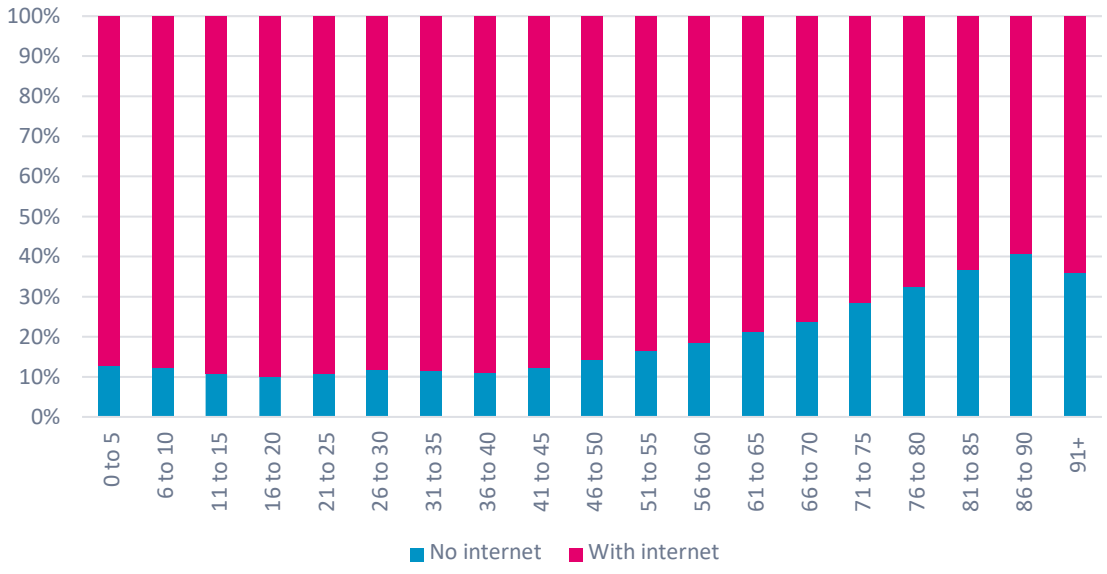
Figure 18 shows internet access by age, stratified by ethnicity. We see that New Zealand Europeans have very high internet access in younger age groups, only reaching the national average of 9% without internet at age 56–60. Older age groups are much more likely to be without the internet at up to 37%. Māori have a higher proportion without internet in younger age groups at about 10% for children and young people. The proportion also starts increasing at an earlier age, reaching 14% at the 45–50 age group. The proportion without internet is also higher for older people at up to 41% for the 86–90 age group. Pacific peoples again have higher proportions without the internet in younger age groups and up to 27% for older people.

Figure 18 Individual internet access, by age and ethnicity

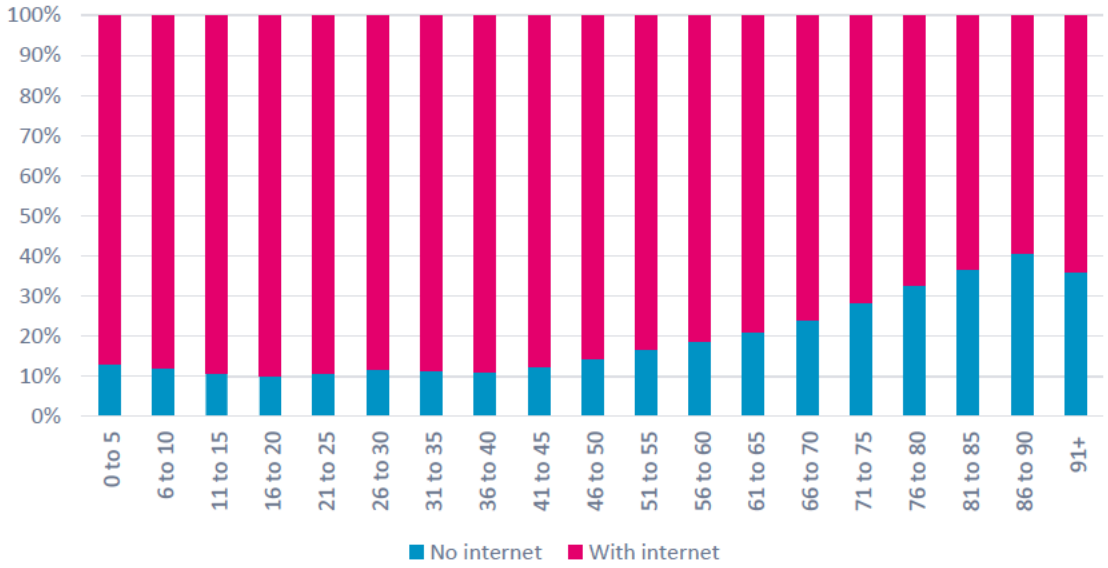
New Zealand European



Māori



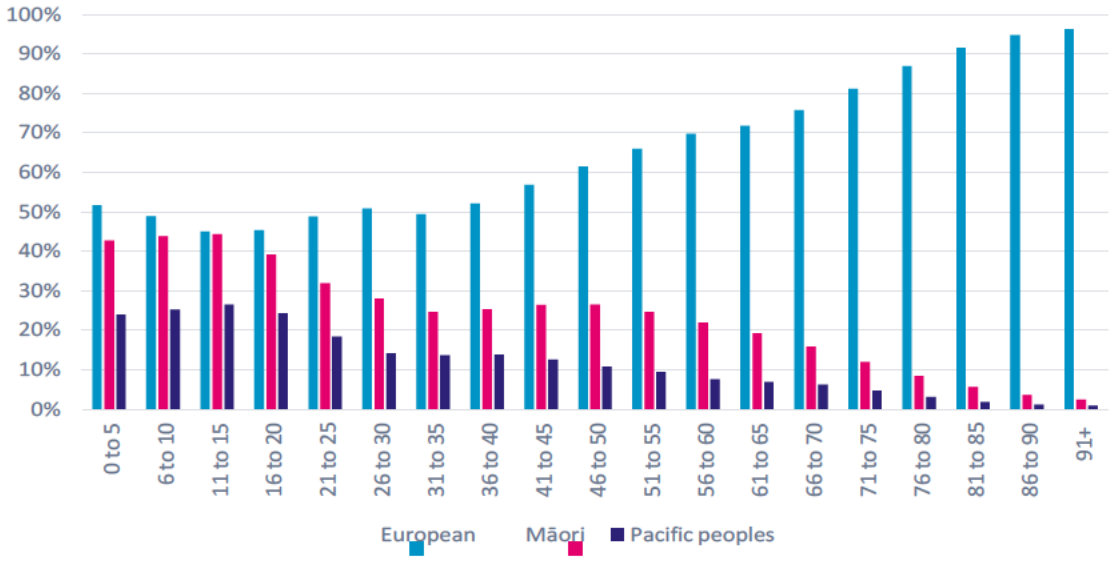
Pacific peoples



Source: NZIER using Census 2018

Figure 19 combines these findings to show the ethnicity and age groups of those who do not have the internet, which we can compare to the general population in Figure 20. Taken together, we find that being without internet access is concentrated amongst people aged 75+ for New Zealand Europeans, who also make up a greater proportion of people at these older age groups. Māori and Pacific peoples are disproportionately affected at younger age groups, meaning more years of disadvantage during important school years and years in employment. That these populations are less likely to reach the older ages is an issue driven by structural inequalities and systemic racism, which would be perpetuated by a focus on older people alone.

Figure 19 People without internet access, by age and ethnicity



Source: NZIER using Census 2018

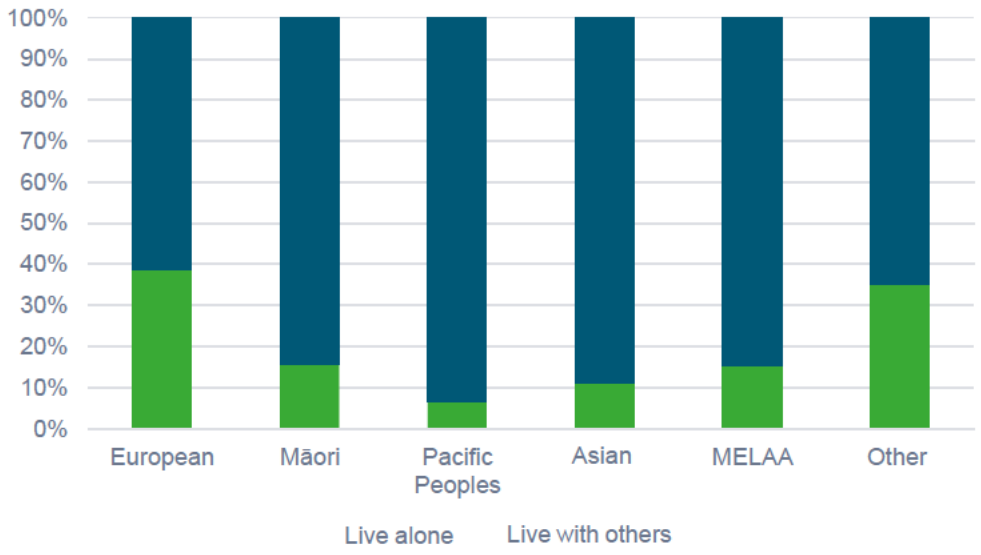
Figure 20 General population, by age and ethnicity

Source: NZIER using Census 2018

Number of people in household and ethnicity

For people living in households without the internet, Figure 21 shows the proportion of those living alone and living with others by ethnicity. New Zealand Europeans and those in the 'Other' category without internet are most likely to live alone. Pacific peoples without the internet are most likely to live with others at 93%.

Figure 21 Households without internet: proportion of people living alone and with others, by ethnicity



Note: MELAA is Middle Eastern/Latin American/African

Source: NZIER using Census 2018

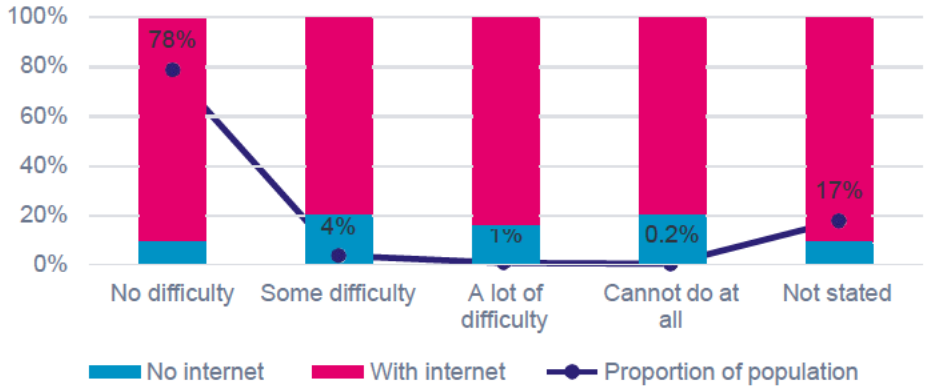
Disability

The 2018 Census was the first to include The Washington Group set of questions for capturing disability statistics (Washington Group on Disability Statistics n.d.). These questions ask a person's level of difficulty across five domains: communicating, hearing, seeing, walking and washing. The response rate for these questions is lower than the question about internet access at 84%.

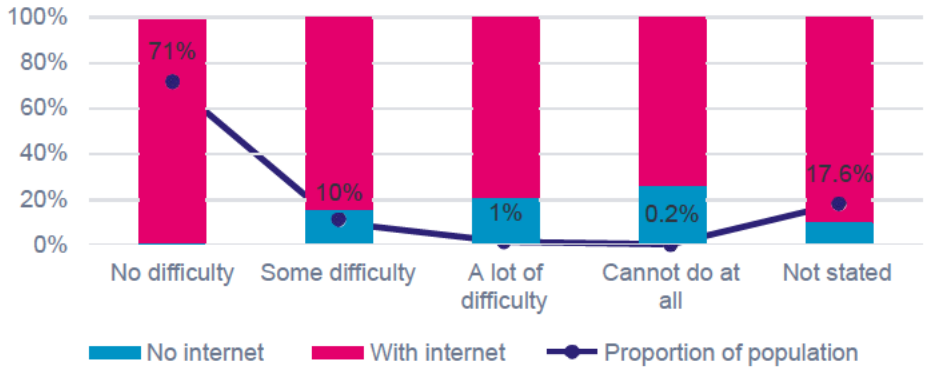
Figure 22 shows the proportion of people with and without internet in the home by response for each disability domain. We also show the proportion of the total population who report each level of difficulty on the labelled line. Across all domains, people with no difficulty have the highest level of internet access. Most significantly, 26% of people who report being unable to see at all are without the internet, as are 25% of people who cannot hear at all. 24% of people with a lot of difficulty walking do not have internet access.

Figure 22 Internet access by disability

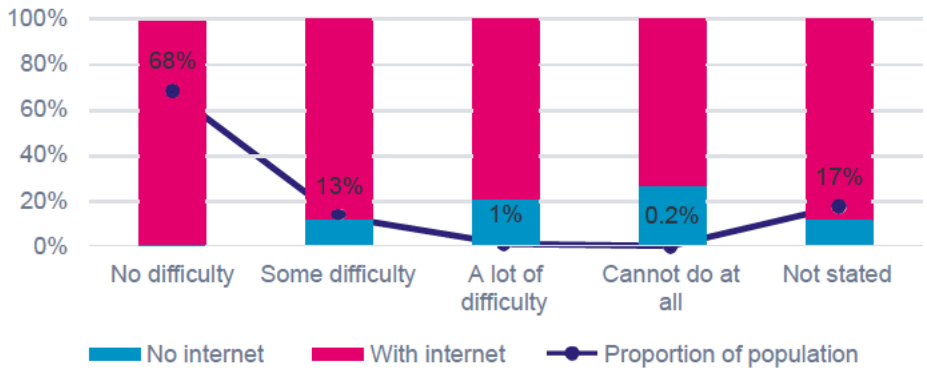
Communicating



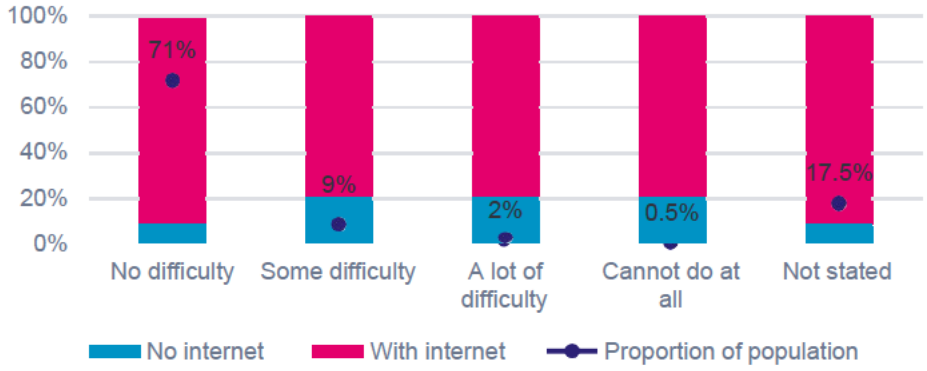
Hearing



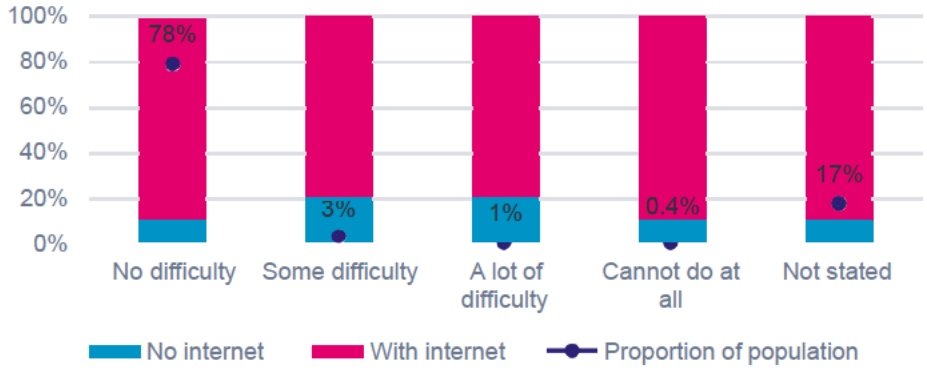
Seeing



Walking



Washing



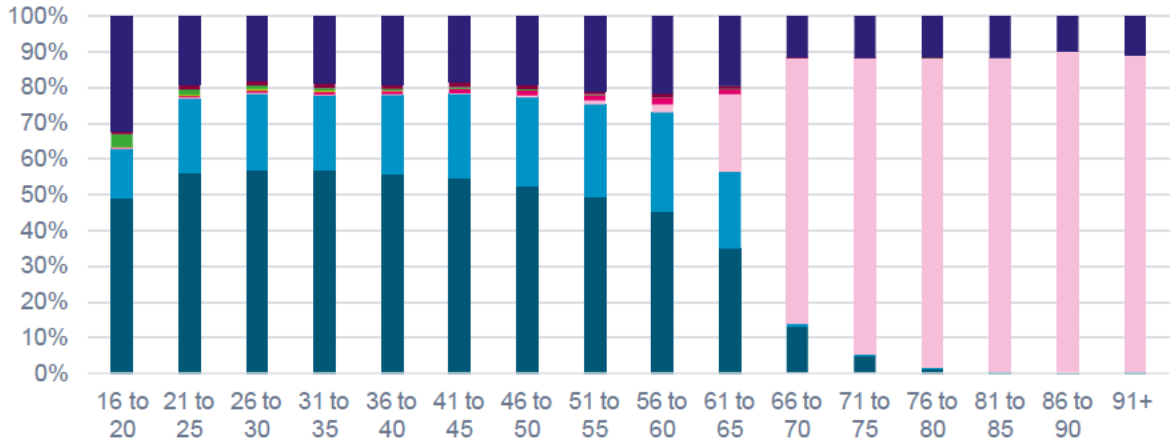
Source: NZIER using Census 2018

Income

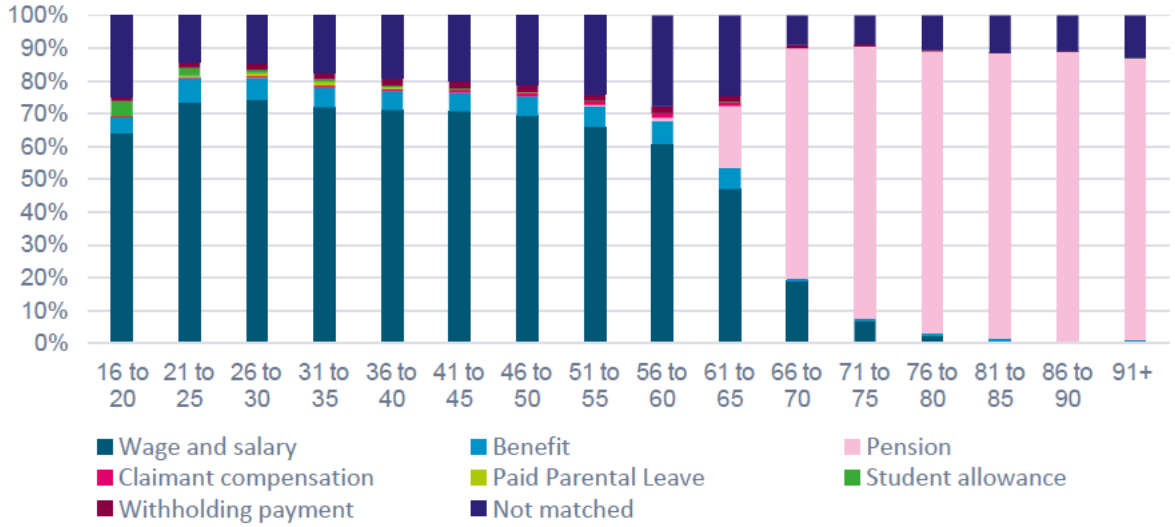
Figure 23 shows the main sources of income by age for everyone aged 16 and over by internet status. In households with the internet, people are much more likely to have wage and salary as their main income source, averaging at 69% across groups aged up to 60 compared to 53% for those without the internet. Those without the internet also have a higher proportion receiving benefit as the main source of income at 22% compared to 6% across groups aged up to 60.

Figure 23 Main source of income, by age group

Without internet



With internet



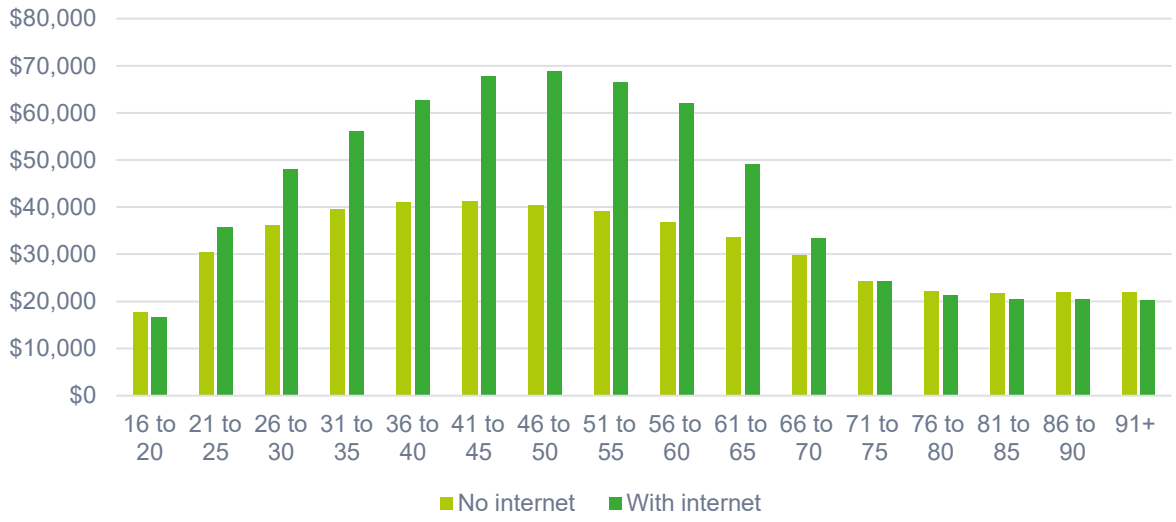
Note: 'Not matched' is people in the 2018 Census data who do not match to 2018 IRD data

Source: NZIER using Census 2018 and IRD

Average income from all sources

Figure 24 shows the average income from all sources by age group for those with and without the internet. Here, the sample only includes people from the 2018 Census who match to a positive wage and salary amount in 2018. Average incomes have the greatest difference between ages 30–65, and there is no difference for ages 70+.

Figure 24 Average income from all sources, by age group (2018 NZ$)



Note: Sample only includes people from the 2018 Census who match to a positive wage and salary amount in 2018

Source: NZIER using Census 2018 and IRD

Barriers to internet access are unclear

From a policy perspective, it is unclear what reasons drive those without the internet. For those aged 71+, it is possible that being without internet is a default setting and this digital divide driven by age will naturally reduce over time as more digital natives enter older age, as suggested by Grimes and White (2019). The stark difference in average incomes affirms that affording an internet connection or prioritising internet with a limited budget may prevent many from having a connection at home. This finding is well aligned with previous qualitative research (Elliott 2018; PeopleForPeople 2021).

We do not see rural internet access appear as a key group, which may be due to the reductive nature of the Census question. However, these findings suggest that investment could be more efficiently targeted towards those groups identified without internet access where infrastructure is already in place but inaccessible to some.

A.7.4 Unanswered questions

This data reveals some important new information about who is without the internet in New Zealand. However, due to data limitations, there are several avenues we are unable to explore. We hope that addressing these research questions will be possible in the future.

- **What is the causal relationship between internet access and outcomes?** Answering this question would be possible through evaluation of an intervention that increases internet access and with affected households recorded in linked data.
- **What do digital skills look like in New Zealand?** Currently, we are unable to say how many of those with the internet at home also have the skills to use it. This information is crucial for a well-rounded understanding of digital inclusion.

- **How are the effects of internet access felt at a community level?** An understanding of how internet access affects not just the household but the community is important for fuller appreciation of the benefits.
- **How does the internet affect outcomes following the COVID-19 lockdowns?** Unfortunately, our data sources are all from 2018, before COVID-19 shifted attitudes towards connectivity and brought new reliance on the internet. Due to this shift in the past 2 years, we acknowledge that any findings based on 2018 are already outdated. More timely data is essential for ensuring the current environment and needs are fully catered for.

Appendix B What makes a successful digital inclusion intervention?

In this section, we consider the effectiveness of tried and tested digital inclusion interventions. We defined these as interventions that assist those at risk of digital under-inclusion to improve access, skills, motivation or trust. Overall, we did not unearth many examples of interventions that were evaluated with a long-term perspective.

B.1 How we did this review

In this literature scan, we undertook searches using a combination of terms and phrases to find material that considered or evaluated government and non-government interventions to promote digital inclusion. We drew on material that we collected for the literature review on the costs and benefits of digital inclusion. We also received material from the Digital Council for Aotearoa, the Department of Internal Affairs and other stakeholders.

Search terms and phrases

We began our scan using the following terms and phrases: 'digital inclusion', 'digital exclusion', 'economics', 'skills', 'internet access', 'data literacy', 'digital divide', 'economic impact', 'digital inequality, 'data poverty', 'internet poverty', 'intervention'. We included other terms as our search progressed.

We searched the Econlit, Ebsco and Proquest research databases as well as Google and Google Scholar. We gathered additional material by scanning reference lists of publications obtained.

The discussion below focuses on literature from Australia, Canada, the UK, the US and Aotearoa New Zealand. We selected these jurisdictions because they share a similar institutional context that lends itself to policy and practice comparisons. Digital inclusion interventions are remarkably consistent across countries, including Aotearoa New Zealand.

Banks and other businesses that increasingly deliver their services online support research and programmes to address digital inclusion (BNZ 2021; Lloyds Bank 2021). We have not found material that reports on internal work these organisations have undertaken to support their clients who do not have digital access or skills to use their services.

B.2 Multilateral digital frameworks

Multilateral organisations including the United Nations (UN), Organisation for Economic Co-operation and Development (OECD), European Union (EU) and Asia-Pacific Economic Cooperation (APEC) have programmes to support digital transformation. The UN Secretary-General's Strategy on New Technologies (United Nations 2018) defines how the use of new technologies can support and accelerate achievement of the 17 Sustainable Development Goals, in part to ensure these technologies do not generate more inequality and violence. APEC agreed its Internet and Digital Economy Roadmap in 2017 to provide guidance on key areas and actions to facilitate technological and policy exchanges among member economies and to promote innovative, inclusive and sustainable growth (APEC 2021).

The EU's digital work programme Shaping Europe's Digital Future is wide ranging, covering regulation, data sovereignty and innovation. Since 2014, the EU has used the Digital Economy and Society Index (DESI) to monitor Europe's overall digital performance and track the progress of EU countries in their digital competitiveness across four themes:

human capital, digital infrastructure, integration of digital technology and digital public services (European Commission 2021).

Started in 2017, the OECD's Going Digital project aims to help policy makers better understand digital transformation and develop appropriate policies to help shape a positive digital future because government policies have not kept up with digital transformation processes and impact (OECD 2019). The Going Digital project aims to help member governments and their stakeholders "to shape the digital future to harness digital transformation to improve the lives of all people" (Lesher, Gierten and Attrey 2020).

The Going Digital Integrated Policy Framework is designed to help countries develop a coordinated whole-of-government approach to digital transformation across seven interrelated policy dimensions of:

- access to communications infrastructures, service and data
- effective use of digital technologies and data
- data-driven and digital innovation
- good jobs for all
- social prosperity and inclusion
- trust in the digital age
- market openness in digital business environments.

Interventions to address digital inclusion are integrated into the policy framework for digital transformation. The OECD acknowledges that cross-cutting issues such as gender, skills, digital government and data governance also need to be taken into account (OECD 2020).

B.3 National digital strategies

Multilateral organisations promote the development and implementation of national strategic frameworks for addressing digital transformation. These frameworks might encourage member state governments to recognise the systemic impact of digital technology and transformation on their societies and economies and provide the impetus to build digital inclusion into policies such as education and training and employment.

B.3.1 United Kingdom

The UK Government published its Digital Strategy in March 2017. It's seven pillars are:

- building world-class digital infrastructure for the UK
- giving everyone access to the digital skills they need
- making the UK the best place to start and grow a digital business
- helping every British business become a digital business
- making the UK the safest place in the world to live and work online
- maintaining the UK Government as a world leader in serving its citizens online
- unlocking the power of data in the UK economy and improving public confidence in its use. (Department for Digital, Culture, Media and Sport 2017)

The digital strategy was developed as part of the post-Brexit industrial strategy and has a strong business focus. The Department for Digital, Culture, Media and Sport identified 10 tech priorities for building back better after COVID-19 based on the Digital Strategy pillars and amplifying the development of the digital economy. Commentary from the Good Things Foundation suggests that implementation of the strategy has been slow (Good Things Foundation 2021b).

Scotland and Wales each have their own digital strategies (Digital Scotland 2021; Welsh Government 2021). Digital Scotland is aligned with Scotland's National Performance Framework for national wellbeing across economic, social and environmental factors (Digital Scotland 2021, 15). There are three priority themes: people and place (no-one left behind), the digital economy and digital government and services.

The vision for Digital in Wales is "improving the lives of everyone through collaboration, innovation and better public services". This is supported by six missions:

- Digital services: Deliver and modernise services so that they are designed around user needs and are simple, secure and convenient.
- Digital inclusion: Equip people with the motivation, access, skills and confidence to engage with an increasingly digital world, based on their needs.
- Digital skills: Create a workforce that has the digital skills, capability and confidence to excel in the workplace and in everyday life.
- Digital economy: Drive economic prosperity and resilience by embracing and exploiting digital innovation.
- Digital connectivity: Services are supported by fast and reliable infrastructure.
- Data and collaboration: Services are improved by working together, with data and knowledge being used and shared (Welsh Government 2021, 7–8).

B.3.2 Australia

The Australian Digital Inclusion Alliance (ADIA) listed a significant number of digital initiatives across federal and state government, business and NGOs. Noting the fragmented nature of these initiatives, the ADIA argues that there is a need for a whole-of-government strategy or national roadmap so businesses, non-profits and government can work towards increasing digital inclusion in Australia (Australian Digital Inclusion Alliance 2020). With support from the Department of Infrastructure, Transport, Regional Development and Communications, the National Indigenous Australians Agency was in consultation with Indigenous organisations and communities, businesses and government agencies during 2021 on the development of an Indigenous Digital Inclusion Plan (National Indigenous Australians Agency 2021).

B.3.3 Canada

The Canadian Government has a digital government programme but no overarching federal digital strategy (Treasury Board of Canada Secretariat 2020). In 2018, national digital and data consultations informed the preparation of a digital charter with 10 principles, including universal access. A Bill to implement the charter was introduced to Parliament in 2020, but following the election in 2021, it is not clear if the government will revive the original Bill or redraft it.

The federal government has funded digital inclusion initiatives under the Digital Literacy Exchange Program established in 2017 with funding of C$29.5 million to be disbursed over 5 years ending in 2022. It supports non-profits to develop and implement digital literacy initiatives that target groups with lower-than-average digital literacy skills. None of the federally funded programmes are offered in every province (Hudes 2021).

B.3.4 United States

Similarly, in the US, there is no national digital strategy. Digital infrastructure, including access to broadband, is inconsistent across the US. Federal programmes that subsidise access for low-income households are devolved to the states to implement. Some states and cities have digital inclusion strategies. The Infrastructure Investment and Jobs Act was passed in August 2021. The Act includes the Digital Equity Act. The Act sets aside US$65 billion for a broadband proposal that is designed to "connect every American to reliable high-speed internet". Of this funding, US$2.75 billion has been allocated over 5 years to digital equity planning, implementation and grants programmes (Scorse 2021).

B.3.5 Aotearoa New Zealand

The New Zealand Government completed the first round of consultation on its digital strategy in December 2021 and aims to publish the final strategy in 2022 (digital.govt.nz 2022). *Te koke ki tētahi Rautaki Matihiko mō Aotearoa: Towards a Digital Strategy for Aotearoa* is built around three themes: mahi tika – trust, mahi tahi – inclusion and mahi ake – growth. These themes need to be braided together to successfully deliver on the overall goal of "enabling all of Aotearoa New Zealand to flourish and prosper in a digital world".

B.4 The role of non-government organisations

Non-government organisations (NGOs) are significant in analysis and advocacy for digital inclusion and in the provision of strategy and interventions in the countries reviewed here. Some are national coalitions that aim to influence policy such as the Australian Digital Inclusion Alliance (ADIA), the National Digital Inclusion Alliance (NDIA) in the US and the Digital Equity Coalition Aotearoa (DECA).

NGOs generally work on digital inclusion in the context of wider social and economic deprivation. They are more trusted in some communities than official government agencies so they have a better reach. Community hubs can bundle digital inclusion programmes from different funders and often provide an unofficial navigator role for other service providers and agencies. They can also be intermediaries to combine outputs from government, business and other organisations.

B.5 NGO blueprints

In the UK (and Australia), the Good Things Foundation is one of the leading non-government organisations working to increase digital inclusion. In 2021, it published a blueprint to fix the digital divide, calling for the UK Government to put digital inclusion at the heart of the COVID-19 recovery (Good Things Foundation 2021b). It set three goals of:

- digital skills – so everyone can use the internet for life and work
- community support – so everyone has somewhere local to go for internet help
- affordable internet – so everyone has the everyday internet access they need.

Good Things Foundation argues for government to reduce data poverty by working with telcos and others. It is working with telco and tech partners in the UK to develop a Data Poverty Lab to co-create sustainable solutions.

Also in the UK, Cumberland Lodge is a charity with a mission to empower people through open dialogue and debate to tackle the causes and effects of social division. Cumberland Lodge completed a project on digital inclusion in 2020 that included a cross-sector conference and follow-up consultation with a smaller group of stakeholders (Elahi 2020). Its recommendations set out a holistic approach to digital transformation and inclusion:

- Develop a society-wide commitment to a future digital society and further digital innovation – a thorough policy approach will help address gaps in digital skills attainment and provision.
- Adopt a co-design process to integrate technologies into everyday routines, taking into consideration user differences.
- Help to reduce digital inequalities by investing in greater digital literacy.
- Focus digital innovation policy on micro-actions that are tailored to specific circumstances rather than pursuing a one-size-fits-all approach.
- Facilitate a digital resilience shift in education and other provisions so that parents and teachers are better equipped to support resilience building amongst young people
- Investigate opportunities for online voting and harnessing digital technologies to increase political participation.
- Incorporate verification methods and safeguards into online voting to enhance security and safety and to help allay concerns about data protection, fraud and anonymity whilst maintaining accessibility.
- Make arts and culture sector websites and online content more accessible to help reduce inequalities in access.
- Focus more attention on improving data transparency to address concerns about digital rights and privacy.
- Preserve physical access to information, services and resources whilst continuing to develop accessible digital technologies.
- Create appropriate frameworks for responsible digital governance and e-citizenship.
- Implement both top-down and bottom-up formal and informal interventions to support greater digital literacy and responsible citizenship.
- Carry out further cross-sector research into the complexities and intersectionality of digital exclusion and inclusion to inform effective responses.

B.6 What do existing interventions look like?

Programmes to promote access and digital skills have been under way across the world for some time. In Aotearoa New Zealand, the 20/20 Trust started the Computers in Homes programme in 2000 (20/20 Trust 2018). These programmes are broadly similar across Australia, Canada, the UK and the US. Informed by the Motivation Access Skills and Trust (MAST) framework, these support the digitally under-included primarily by providing access

to devices, the internet and skills training. These programmes have informed digital inclusion research and initiatives in Aotearoa New Zealand.

In this section, we summarise the main configurations of intervention approaches across the countries in focus. These fall into three broad categories that address connectivity access, affordability, and digital capability and skills.

B.6.1 Connectivity – internet infrastructure and rural access

Some parts of the population are digitally under-included because they do not have access to reliable and resilient connectivity. Around the world, there has been considerable investment in the infrastructure to deliver fixed and mobile connectivity over the past 20 years, including in New Zealand. However, the shift online due to COVID-related restrictions exposed gaps in the quality and affordability of digital connectivity. Resolving these issues requires partnership between government and industry, including agreement on minimum standards (World Economic Forum 2020).

In rural communities, access to the internet and mobile communications is often limited and unreliable, and costs can be higher (McMahon 2020). Often framed in commercial terms as the 'last mile' of development and delivery, telecommunications companies are reluctant to provide a service if they cannot recover the cost of investment from users.

Connectivity and affordability access are issues for Indigenous peoples in Australia, Canada and the US, where Indigenous peoples are more likely to live in remote areas with limited or no telecommunications services. In Australia, although there are fast internet connections in most Northern Territory centres, in Alice Springs, it stops short of the Town Camps (Guenther 2020).

Indigenous advocates in Canada reframed the 'last mile' issue. They proposed a supply-side digital inclusion policy that focuses on the 'first mile' of community-owned and operated infrastructure and services as an alternative to the 'last mile' commercial link. The First Mile Connectivity Consortium, an association of First Nations technology service providers, advocated with the CRTC over a number of years and consultations to recognise broadband as a basic service and to establish an infrastructure fund for under-served areas (McMahon 2020, 11). This is an example of co-design where First Nations worked with the CRTC to achieve outcomes that meet their vision for their communities (McMahon 2020).

In Aotearoa New Zealand, the government has programmes to improve mobile coverage and provide infrastructure in rural Aotearoa New Zealand. The Telecommunications Development Levy was established by legislation in 2011. Currently set at $10.1 million, it is used to subsidise telecommunications infrastructure including the relay service for the deaf and hearing-impaired, broadband for rural areas and improvements to the 111 emergency service.

Completing the 'last mile' in some parts of Aotearoa New Zealand has significant costs, which will not be recovered from users. In some semi-rural areas, the infrastructure has not been upgraded so that it meets current user requirements, again because the investment cost outweighs the return. Engaging with Māori and rural communities may identify models that address connectivity and quality issues.

B.6.2 Access – affordability focus

Recognising that affordability is a major factor in digital under-inclusion, many interventions are designed to address affordability of devices and the internet either through subsidies or direct provision.

In Canada and the US, government programmes subsidise the cost of access to the internet for low-income households. Funded nationally, delivery is community or state/province based, leading to variation in outcomes. These programmes have very low income thresholds.

The US Lifeline programme started in 1985 to help low-income families pay for telephone services. Administered by the Federal Communications Commission, it has been adapted to include broadband and mobile services. Funding for digital inclusion programmes has been a component of government packages to mitigate the economic impact of COVID-19, but these are short term and delivery varies from state to state and within states. Of these, the Emergency Broadband Benefit (EBB) had broader eligibility criteria and significantly higher subsidies. It was time limited by the budget cap of US$3.2 billion, but the EBB could be a model to replace the Lifeline programme (Hudes 2021).

B.6.3 Digital capability and skills

In the US, Rhinesmith (2016) found that the most successful programmes focus on providing low-cost broadband, making low-cost computers available, operating public access computing centres and connecting digital literacy training with relevant content and services. Reflecting the fragmented approach to digital inclusion programmes, Rhinesmith noted the importance of citywide and regional digital inclusion initiatives and collaboration and the need for outcomes-based evaluation and digital inclusion to be connected to broader policy goals.

In the context of identifying programmes that could be adopted in the city of Toronto, Hudes (2021) cites three digital literacy programmes that have multifaceted objectives:

- Media Smarts' Digital Navigators provides non-digital support by cultivating partnership with trusted community organisations.
- Computers4Life combines digital literacy training and subsidised devices for low-income people with limited English ability.
- Project Linkvan.ca is a web-based app that links users with internet service hubs and other digital resources in downtown Vancouver and supports traditional literacy as well as digital literacy.

In the UK, Good Things Foundation has worked with a range of private and public sector partners since 2009. Its programmes support digital skills development for day-to-day and work-related needs, access to devices and data and community support, including community development. Its model is built on their Online Centres Network made up of community centres, public libraries and social enterprises in village halls, places of worship, cafés, social housing, retirement homes, mobile buses, pubs, clubs and bingo halls. These are centres of trust in the community that support a range of services in addition to digital programmes.

The UK's Future Digital Inclusion programme has been in place since 2014. Funded by the Department for Education, it assists people to learn basic digital skills. The evaluation found

that the factors for success are high tutor to learner ratios, regular positive feedback for learners, no time limit for learning, flexible start dates and a standardised learning framework that learners can navigate at their own pace. Because Online Centres are not all similarly structured and resourced, there is variation in outcomes between centres. Good Things found that more than 80% of the learners face one or more barriers related to social exclusion. Although some learners found there is no clear pathway for further learning, more than 80% progressed to further learning and 66% progressed to employment-related activity (Good Things Foundation 2019).

Everyone Connected, supported by Barclays Bank, delivered devices and connectivity as an emergency response to COVID-19 when access to Online Centres became restricted (Good Things Foundation 2021a). The key finding was that setting up recipients with devices went hand in hand with teaching them the necessary skills to use them. Only 4% of recipients were not regular users of the internet prior to receiving their device, but almost a third needed "considerable support".

In 2019–21, Good Things Foundation worked with 15 grantee (provider) organisations, each delivering their own projects, to deliver the Power Up programme (Good Things Foundation 2021c). This programme's aim and approach was to create "a step change in the way that support for individuals, businesses and communities is designed and delivered expressed in its framework for local action: Powering Up People, Powering Up Provision, Powering Up Places". It aimed to help people seeking jobs or job progression, those managing money on low incomes and sole traders or owners of micro-businesses to develop digital skills so that they could improve their lives, communities and businesses.

The programme challenged grantees to embed digital into their programme delivery and connect with local organisations, service providers and others to provide joined-up support for their clients (beneficiaries). Power Up was limited to four locations. Its delivery coincided with the COVID-19 pandemic, and the outcomes varied. The independent evaluation recommended that Good Things Foundation continue to develop this programme because it delivered results for the clients, and in some cases, it had transformative effects for the providers, noting that it is a continuous process to learn what embedding digital looks like. The Power Up programme is moving into its second phase, which will continue the development around place-based change and how to accelerate progression.

The impact on the grantee/provider organisations emerged as one of the most powerful outcomes. Providers were required to develop digital provision of their services, which challenged organisations to reassess their own systems and processes. Although the funding for Power Up was short term, grantees were encouraged to develop programmes that were financially sustainable over the medium term. For some, this meant that they were able to respond to the impact of COVID-19 quickly. The evaluation emphasised that this approach is complex, time consuming and resource intensive (Good Things Foundation 2021c, 20–21).

Three broad ways of defining 'embedding digital' emerged within the programme evidence:

- Organisational/local partner perspective on the place of and systems for beneficiary digital skills development in its offer of support to beneficiaries (organisational or place-based view of embedding digital).
- Beneficiary perspective of their learning or support experience and the place of digital skills development within it (beneficiary view of embedding digital).

- Organisation's own ways of working and how it delivers its provision (digitisation) (Good Things Foundation 2021c, 15).

The outcomes for sole traders and micro-businesses were not as positive as for other parts of the Power Up programme. This may be because many businesses were not actively trading or were in the very early start-up phase (Good Things Foundation 2021c, 4). Businesses were provided with training on online sales, use of social media and financial systems, but these were often not the only issues that the business owners needed assistance with. These conclusions echo the New Zealand experience (digital.govt.nz 2021). There is considerable experience in New Zealand (and offshore) of supporting business transformation that could inform policy, for example, Business Mentors NZ, economic development agencies, Callaghan Innovation and business incubators.

B.7 Community

Examples from Australia and Canada underline that recognition of te ao Māori in the digital world, and Māori leadership is central to addressing digital inclusion in Aotearoa (New Zealand Government 2021). Digital inclusion is nuanced and should recognise culture and community ownership (McMahon 2020, 9). Guenther notes that, in Australian Indigenous communities, many respondents described digital inclusion as "support for" skills, access and advocacy. It is not just about having skills. It is fundamentally important to these communities that they are empowered to have "a voice to service providers" about what they want and need (Guenther 2020, 9).

Interventions to address digital skills/literacy cited in the literature are community based. People learn from a variety of sources – whānau/family, friends, school, workplaces and work colleagues – and increasingly online. The key takeaways from the Australian and Canadian examples are the focus on younger people, the intergenerational effects and the use of mentors and/or role models to illustrate the relevance of digital technology and its potential use and value to individuals and whānau. Whānau, iwi and other communities may choose to adopt and use technology in similar ways to address specific barriers and identify how digital technology can help them to achieve broader goals.

B.8 Co-design

Co-design has been identified as core to developing digital inclusion interventions by Māori (New Zealand Government 2021) and the disability community (DIA 2020a). Much of the international literature on digital inclusion interventions does not refer explicitly to the use of co-design practice. There are examples of digital health interventions that draw on co-design practice elsewhere in the sector in the UK. These interventions are focused on improving engagement on health issues rather than addressing digital inclusion per se.

Cumberland Lodge specified co-design "involving people with different kinds of lived experience at every stage of the development of new digital solutions" (Elahi 2020). Co-design will help reveal unforeseen consequences and boost accessibility and future take-up. Good Things Foundation notes that programmes are more successful when communities and individuals are asked what they want the intervention programmes to focus on (Good Things Foundation 2021c).

There are explicit examples of the use of co-design in the work of First Nations on digital inclusion in Canada. In Indigenous communities, digital skills and digital literacy (and digital

inclusion) are about shaping and using digital technology "in ways that emerge from the self-determined needs of communities" (McMahon 2020, 11). Digital literacy is grounded in local cultures and understandings. In Canada, past Indigenous experience of the education system informs the delivery of digital literacy programmes for school students within First Nations communities based on co-design principles. In Australia, Telstra partnered with the Indigenous Remote Communications Association (now First Nations Media Australia) to create inDigiMOB, which engaged digital mentors to support a range of digital activities determined by the community.

Models of co-design in Aotearoa New Zealand can be used to develop whānau or community-led interventions, drawing on the learning from international community-based interventions if required (Mark and Hagen 2020; Auckland Co-design Lab 2021). For example, Te Tokoturu represents the three interconnected dimensions of strengthening, healing and responding in the existing ecology of wellbeing in the places where we live, learn, work and play. It sees a balance between centrally enabled and locally led approaches organised around the ecologies of wellbeing (Hagen et al. 2021, 6).

B.9 Key insights

Most interventions to digital inclusion can be characterised as helping people to 'catch up' on access to digital devices, the internet and digital skills by helping at-risk groups in defined locations gain access to digital devices and data and to gain the skills they need for their day-to-day lives. The implicit assumption is that digital under-inclusion can be resolved by improving access to digital technology and the skills to use it.

Overall, a number of lessons emerge from this literature scan relating to digital inclusion interventions:

- **People need more than devices and connections.** In the context of the MAST framework, most interventions focus on access and/or skills. Access to technical support and digital skills training is also important.
- **Approaches to digital inclusion intervention are fragmented** with little agreement or consistency on standards, outcomes and goals across regions and organisations. Most are budget and/or time bound, which means that the impact is often temporary.
- **Programmes are often delivered by non-government agencies.** These can be funded by government agencies, fully or in part, with funding support from private sector and philanthropic organisations. Sustained funding is rare.
- **Government has a role in establishing basic infrastructure requirements and telecommunications regulation.**

There are some promising characteristics of successful digital inclusion interventions:

- **Interventions led by individuals' or communities' needs and aspirations are most successful.** These programmes identify leaders or mentors in the communities who role model engagement with digital technology to make it relevant and valuable to the individual or community. Community-based technical and learning support and ongoing mentoring are important for these interventions to succeed.

- **Co-design is important for digitally excluded communities to own digital inclusion initiatives and what they want from it.** When individuals and communities choose how they use digital technology, it can be empowering.
- **Organisations leading or facilitating digital inclusion interventions need to be trusted in target communities**. They can be linked to social and economic support networks. Digital inclusion is often not a discrete issue, and co-location of community digital hubs with other social service organisations provides the opportunity for cross-referral.
- **The needs of people who are digitally excluded because they do not have access to or cannot use digital devices or the internet are primarily addressed by community centres.** These hubs have devices and internet access for public use or provide non-digital ways to access services, including in-person assistance. They do not necessarily address the digital accessibility needs of the disability community or the needs of those with limited mobility.

However, access to community centres has been a major problem during COVID-19. In some cases, facilities moved into other premises (for example, Good Things Foundation Online Centres in the UK) or the service pivoted to phone-based technological support (for example, the US-based National Digital Inclusion Alliance Digital Navigator concept) (Hudes 2021).

Appendix C Measuring the value of free online services

This section describes the details of our survey to identify WTA values for online services.

C.1 Key elements of survey design

The survey design was informed by literature and input from experts in conjoint analysis, the survey platform and cost-benefit analysis. There are five key elements in the survey: the choice of question structure as WTA, the attributes included, the time component, financial rewards and demographic questions.

C.2 Willingness to accept versus willingness to pay

Across the literature on non-market valuations, there is much debate on the relative merits of measuring WTA compared to WTP. While WTA measures the amount of compensation you would accept for giving up something, WTP measures the amount you would pay to keep it. Standard economic theory suggests that the two measures should be the same, but we know from a wealth of evidence that, in practice, they are not (Kahneman, Knetsch and Thaler 1990). This is largely attributed to the endowment effect where we place more value on something we already own.

Sunstein (2020) investigates the WTP and WTA comparisons of social media, finding even bigger discrepancies. The median WTP for Facebook for 1 month was US$1, while the WTA was US$59. Sunstein notes that, in using a discrete choice experiment, some of the discrepancy is removed. However, we still need to frame the question as WTA or WTP. We use WTA due to the risk of 'protest' from WTP in which people are reluctant to pay any money for something that was previously free. At the same time, we acknowledge that WTA retains its own biases.

C.3 Attributes

A conjoint analysis survey compares the attributes for different alternatives. For this survey, each online service was treated as a separate attribute. We use the following attributes in the survey: internet search, email, online maps, online video, online shopping, social media and online music. As broad categories, these attributes are frequently named in the top ways New Zealanders use the internet (Diaz Andrade et al. 2021; Colmar Brunton and internetNZ 2020). With these attributes, we can also compare our findings with Brynjolfsson, Collis, and Eggers (2019).

Of course, these attributes do not pick up on all the possible benefits. For example, our survey did not include other possible attributes such as news and education services or access to church and cultural events. While these attributes would be interesting to explore, each additional attribute increased the time to complete the survey significantly, so they were limited to manage respondent burden.

C.4 Time component

Our survey was set up to capture WTA values for forgoing each attribute for 1 year. We used 1 year instead of 1 month because the values are designed to inform analysis that is based on yearly measurement. Taking a monthly value and multiplying it by 12 would not

be sufficient for a yearly measure since participants are likely to feel differently about forgoing services for 1 month compared to 1 year. However, this comes at a cost of a more cognitively challenging set-up, as imagining 1 year without digital content is harder than imagining 1 month.

C.5 Including financial rewards to measure WTA

The options we included for a hypothetical reward for forgoing access are highly influential on the result. Set too high, the upper limit will overestimate values, but set too low and we will underestimate the result. Brynjolfsson, Collis, and Eggers (2019) estimate US$17,530 for search engines in 2017, the equivalent of nearly NZ$30,000 today. Our research team agreed that this value was high in the context of New Zealand's economy and household incomes, and anchoring the survey to that value ran the risk of overestimating New Zealand WTA.

We were also constrained by the number of price options we could offer. We could include up to six options, but they had to increase by the same increment. For example, we could have the values of 0, $100, $200, $300, $400 and $500 but not the values of 0, $10, $100, $500, $1,000 and $5,000. We used increments of $1,000, up to $5,000.

C.6 Demographic questions

We included demographic questions prior to the decision-making exercise. These capture gender, age group, ethnicity, disability status and household income group. These questions are in line with Stats NZ survey standards.

C.7 Participant demographics

There were 1,063 respondents to the survey. Of these, we excluded 37 participants who failed consistency checks and one participant with a mean time per choice of under 1 second. This gave us a final sample of 1,025. Of these respondents, 907 were from a consumer panel, and 118 were from snowball sampling and social media.

Table 5 shows the sample demographics. Ethnicity categories are not mutually exclusive, with participants able to select multiple categories. Overall, this survey sample is not representative of the general New Zealand population. While gender is balanced and Māori are well represented at 20% of the sample, it has a higher average household income and is skewed towards the working-age population. In particular, people identifying as Pacific peoples are under-represented in this sample. Also, due to the format of the survey and nature of the questions about internet use, all participants are internet users.

In the interests of transparency, we also include a breakdown of demographics for the Māori participants. This stratification is due to a need to be pragmatic about the representativeness of the Māori sample and being mindful that the sample could be biased towards certain groups within Māori. We see the Māori participants follow approximately the same proportions in demographic categories as the overall sample.

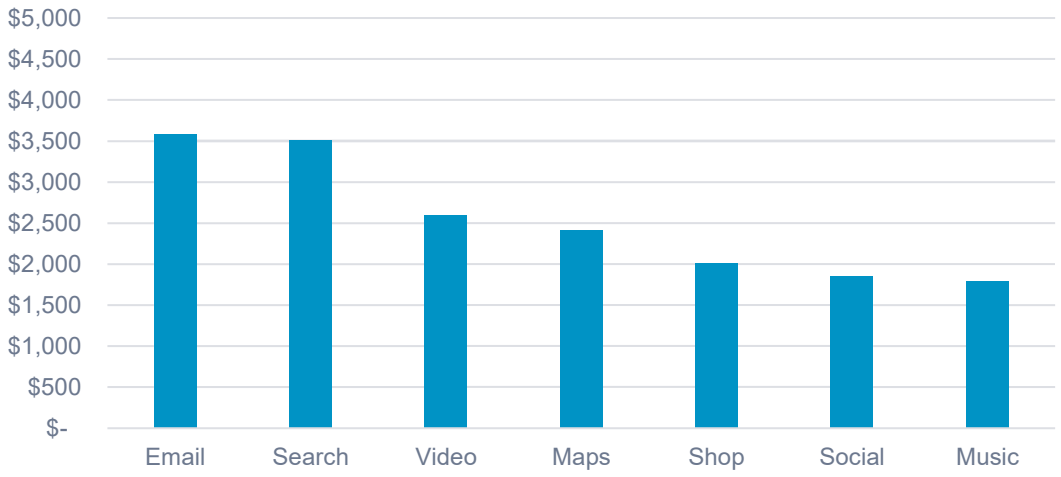
In light of the non-representativeness of our sample, we do not expect our results to fully encompass the value that Māori communities and individuals place on digital services. Further wānanga with Māori that are more representative of the Māori demographic would be required to be certain of the results presented.

Table 5 Survey participant demographics

		All participants		Māori participants	
	Demographic	**Number**	**Percent**	**Number**	**Percent**
Gender	Male	482	47	101	49
	Female	533	52	107	51
	Another gender	4	0.4	0	0
	Prefer not to say	6	1	0	0
Age	0–19	13	1	4	2
	20–29	217	21	40	19
	30–39	177	17	31	15
	40–49	202	20	43	21
	50–59	188	18	43	21
	60–69	134	13	26	12
	70–79	72	7	17	8
	80+	20	2	4	2
	Prefer not to say	2	0.2	0	0
Ethnicity	New Zealand European	758	74	145	30
	Māori	208	20	208	100
	Pacific peoples	18	2	11	5
	Chinese	45	4	1	0.5
	Indian	59	6	1	0.5
	Other	104	10	6	3
	Prefer not to say	15	1	1	0.5
Disability	Yes	155	15	41	20
	No	840	82	161	77
	Prefer not to say	30	3	6	3
Household income	$20,000 or less	37	4	11	5
	$20,001–30,000	59	6	16	8
	$30,001–50,000	74	7	15	7
	$50,001–70,000	120	12	22	11
	$70,001-$100,000	170	17	34	16
	$100,001–150,000	194	19	47	22
	$150,000 or more	202	20	36	17
	Don't know	41	4	9	4
	Prefer not to say	128	12	18	9
Total		1,025		208	

Source: NZIER

C.8 Results



shows the average WTA values for each attribute in the survey. Email and internet search have the highest values followed by video, maps, shopping, social media, and music. In Figure 26, we show the results by the following demographic groupings: Māori, women, aged 60+, household income under $70,000 and disabled people.

In Figure 26, asterisks indicate statistically significant differences between the values for that group compared to everyone else (for example, people aged 60 and over compared to 59 and under).

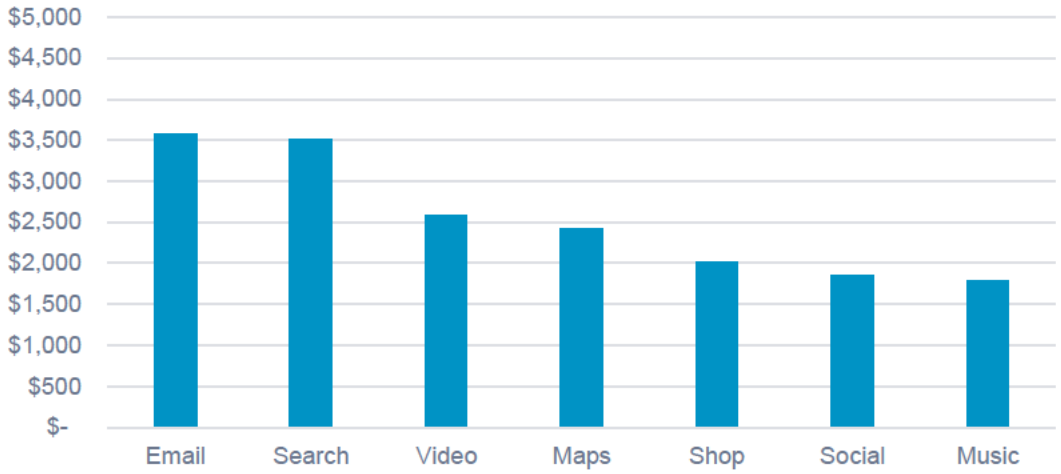
Broadly, the groups have similar rankings and WTA values. Our results show:

- people aged 60+ placed higher value on email access and internet search while putting less value on videos, social media and music
- Māori placed higher value on online music, ranking it above social media and online shopping, and lower value on online maps
- people with a household income under $70,000 put higher value on email and lower value on maps, online shopping and music.

We see no statistically significant differences for disabled people, but this may be attributed to the smaller sample size.

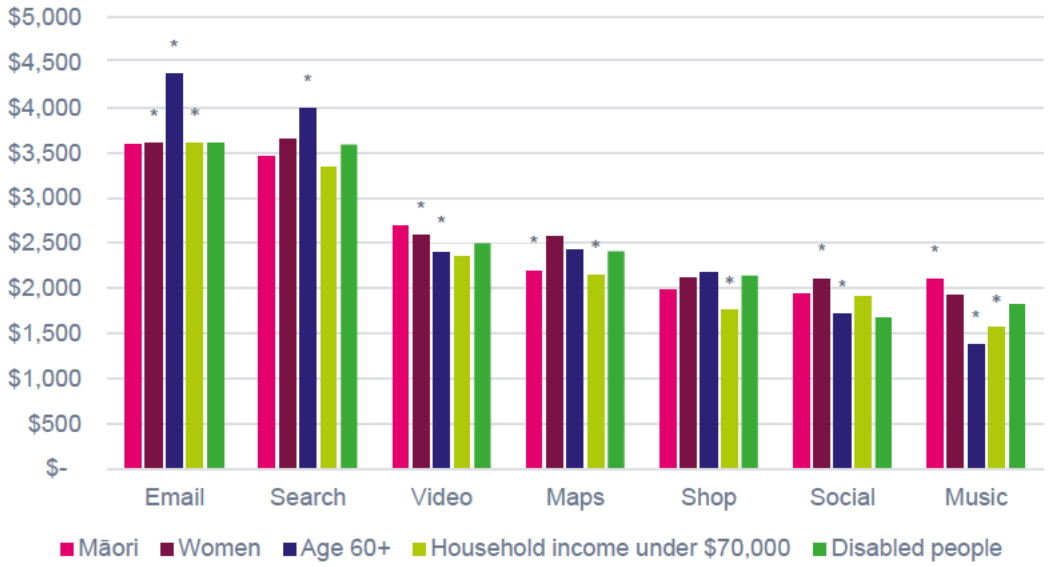
Overall, we found a slightly different ranking compared to Brynjolfsson, Collis, and Eggers (2019). In their study, the researchers found online services ranked in the following order: search, email, maps, video, shopping, social media, music. They also found a much greater range in WTA values than in our survey, which we can attribute to research design.

Figure 25 Estimated value of 1 year of online services (all participants, WTA measure)



Source: NZIER

Figure 26 Estimated value of 1 year of online services, by selected group (WTA measure)



* Statistically significant at the 95% level

Source: NZIER

C.8.1 Open-text responses

At the end of the survey, participants were invited to fill in two optional open-text questions. The questions are provided below with discussions of the responses received.

What ways that you use the internet did you feel were missing from this survey?
43% of respondents left this question blank, and a further 27% said a variation of "none" or "it covered everything". Table 6 shows the most common categories of response. While

some of these categories were included in earlier versions, they were removed for simplicity.

Table 6 Ways of using the internet not covered in survey

Category	Number of responses	Percent
Gaming	48	5%
Banking	39	4%
Online calls, meetings (for example, Zoom or Skype)	38	4%
News	37	4%
Work (for example, working from home, work-related messenger or email)	32	3%
Messaging (for example, Facebook Messenger, WhatsApp)	29	3%
Education (for example, online courses)	21	2%

Source: NZIER

Do you have any comments, or is there anything you think we should know?
54% of respondents left this question blank, and a further 30% said a variation of "none". Several expressed that the survey format was interesting, enjoyable or an accurate representation of their use. Aside from these, the responses to this question were varied.

17 people mentioned that work requirements of access to the internet, particularly email, substantially increased their value:

> *Emails is a requirement for many jobs, so the emphasis on keeping access to emails was mainly driven by my requirement to have it for work. The other choices were more about my personal use.*

> *I need both Google and YouTube for work, so those questions were answered as such. Personally, I rarely watch YouTube but I do Google many things.*

A few participants reflected on the fundamental importance of internet access:

> *Everyone needs access to email, because banks, government and employers have daily functions locked into an email address.*

> *Access to the internet is integrated to our society, it was difficult to imagine a world without the help of online maps or search engines.*

Appendix D The costs and benefits of intervention scenarios

D.1 Measuring the benefits

In this section, we summarise literature on how to measure and value the benefits from digital inclusion.

D.1.1 Existing cost-benefit analysis estimations

The Digital Inclusion Research Group (2017) provides an overview of existing attempts to quantify the economic benefits of digital inclusion internationally. They used benefits calculated by PwC (2009) to estimate that the total economic value of digital inclusion was around NZ$1.5 billion per year for households. Under the assumption that 10% of households were not connected or lacked the motivation to be connected, the authors estimated the cost to New Zealand is at least NZ$150 million per year.

D.1.2 Benefits measured by Cebr (2018)

We focus on the eight benefit channels used by Cebr (2018): time saving to people, increased individual earnings, enhanced employability, online retail transactions benefits, improved social inclusion, more-efficient health services, greater digitisation of government transactions and reduction in digital skills shortages vacancies.

Time savings

Digital devices allow people to access government services online. Many government services during COVID-19 are available online, for example, booking a vaccine appointment or applying for a wage subsidy. Prior to COVID-19, many services were already online, like applying for benefits or a visa. Across the literature, researchers tend to use a proxy of 30 minutes saved for each online transaction (Cebr 2018).

Government transactions

The digital services landscape in New Zealand is different to that of the UK. Table 7 shows the proportion of government interactions undertaken online in July–September 2016. While this shows that about half of common government interactions are completed online, many of them are infrequent interactions, for example, paying for a vehicle licence and filing tax returns are annual events.

Table 7 Proportion of government interactions completed online

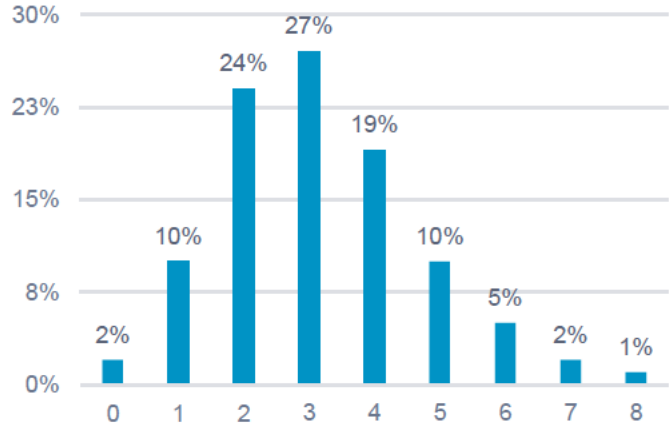
Agency	Service	July–September 2016
Department of Conservation	Book Department of Conservation asset	29.8%
NZ Customs Service	SmartGate	60.6%
MBIE	Apply for visa	30.0%
New Zealand Transport Agency	Pay for vehicle licence	36.6%
New Zealand Police	Pay fine	62.8%
Inland Revenue	File an individual tax return	86.9%
	Pay individual tax	89.4%
	Apply for an IRD number	26.3%

Agency	Service	July–September 2016
Ministry of Social Development	Apply for financial assistance	47.9%
Department of Internal Affairs	Renew adult passport	48.8%
Total		**51.9%**

Source: DIA (2018)

We can combine this with research from 2014 that shows the number of interactions with government per year (Figure 27), when the most common number of government interactions was three.

Figure 27 Number of government interactions per year (2014)



Source: DIA (2018)

Online banking

The World Internet Project NZ 2017 shows 47% of respondents paid bills online or used e-banking weekly, and 11% did so daily (Diaz Andrade et al. 2018). However, these transactions may be due to ease of use and not simply replacing a physical trip to the bank. The Computers in Homes evaluation found that, of those who participated, 65% did internet banking every week followed by 18% every day (20/20 Trust 2018).

Earnings and employability

Digital skills are associated with increased earnings and employability. Cebr (2018) estimates that people who have learned basic digital skills could expect a lifetime increase in average hourly earnings of 2.8% and apply this to the lowest wage quartile. The estimated increase of 2.8% is in line with OECD recommendations. Cebr (2018) also estimates that, of those adults who are digitally excluded and unemployed, 5.5% will move into employment.

Education

The relationship between digital access and education outcomes is complex. In New Zealand, evidence suggests that using digital devices in the classroom can actually harm student learning (Sutcliffe 2021). We know relatively little about the impact of digital devices at home on education outcomes. The Programme for International Student Assessment (PISA) 2018 shows poorer maths, reading and science scores for 15-year-olds

who do not have a computer at home to use for school work relative to those who do. However, we cannot attribute this gap to computer ownership or access alone. In assessing global PISA data, the OECD finds a hill-shaped relationship between the use of computers at home and education outcomes, with those using computers least and most frequently having worse scores than those with moderate use (OECD 2015). It is therefore challenging to anticipate the direct education consequences of digital access.

On the other hand, since COVID-19, home digital access has become essential for school attendance, which is a key indicator of education performance. Schools also present an opportunity to deliver digital skills training, which can promote long-term safe internet practices. Given uncertainty about the future of education in light of COVID-19 and the role technology will play, we do not include estimates for the educational benefits of digital inclusion. We recommend this important topic is revisited in the future.

Health

There are many potential health benefits of digital access, including the ease of online booking for GP appointments, searching for medical information online, accessing health records and managing e-prescriptions. During COVID-19, telehealth (health consultations online) was widely used to avoid the risk of infection for patients and health professionals (Geraldine Wilson et al. 2021). New Zealand research shows that patients were largely satisfied with telehealth during COVID-19 (Imlach et al. 2020) and the convenience of e-prescriptions (Imlach et al. 2021). The Ministry of Health's Digital Enablement Programme funded 19 providers to test ways of increasing access to services digitally, including a Digital Health Hub, remote health monitoring and GP enrolment (McBeth 2021).

Intuitively, internet access and digital skills are likely to have positive effects on health due to information access. However, to our knowledge, no previous studies have quantified the effects. Therefore, our valuations for health impacts are likely to be an underestimate of the true effect.

The evaluation of Computers in Homes shows that participants used their computers for health purposes following the initiative. 17% looked at Patient Portal from time to time, and 32% looked for health or medical information online from time to time – 19% once a week and 9% every day (20/20 Trust 2018).

Social connection

The internet provides a way for people to stay connected. Emails, video chat and social media are all ways that whānau and communities can maintain relationships. These channels are particularly important for people who live alone or at a distance from others.

There is little evidence quantifying the relationship between digital access and loneliness. One study focuses on the impact of internet use on loneliness among older adults (Cotten, Anderson and McCullough 2013). The authors find that a 1-point increase in internet use (on a 3-point scale) was associated with a 0.15-point decrease in loneliness scores, also on a 3-point scale.

Retail savings

Online shoppers can make significant savings through access to retail with less overhead costs and greater ability to shop around. Unsurprisingly, online shopping saw extraordinary growth throughout 2020. Older age groups saw the highest growth, both in numbers shopping, frequency and spend. The 2021 New Zealand eCommerce review, commissioned

by NZ Post, found that shoppers aged 30–44 are the most likely to be online shopping (NZ Post 2021).

International research gives some indication of the benefits of online shopping. Dolfen et al. (2019) assess the consumer surplus from e-commerce in the US The authors estimate that e-commerce gave consumers the equivalent of a 1% permanent boost to their consumption or over US$1,000 per household.

D.2 Measuring the drawbacks

Aside from the benefits, there are harms associated with digital access. These harms include cybercrime, social media harm, misinformation and disinformation.

D.2.1 Cybercrime

The Computer Emergency Response Team (CERT NZ) reports that online scams and fraud cost people $4.2 million per quarter or $16.8 million per year (CERT NZ 2021). This is equivalent to $11 per online household. However, we expect the likelihood of being a victim of an online scam is greater for those who are newly online.

D.2.2 Social media

We know that, on average, people have a willingness to pay for social media above $0 and therefore many experience a consumer surplus from using the service for free. However, Allcott et al. (2020) suggest that this consumer surplus may be overstated if users do not understand the ways in which social media can be addictive or reduce wellbeing. There is evidence that decreasing social media use has benefits for wellbeing. The authors note that experimental participants who deactivated Facebook valued it less afterwards by 14%.

D.2.3 Misinformation and disinformation

The Disinformation Project reports that, since the return to lockdowns in August 2021, there has been a sharp increase in the popularity and intensity of disinformation relating to COVID-19 spread through online channels (Hannah, Hattotuwa, and Taylor 2021). This spread of harmful content threatens health as well as presenting wider threats to democratic processes. However, there are few attempts to quantify or monetise the cost of misinformation and disinformation. One recent study estimates a WTP value by asking participants how much tax they would pay for a virtual public-run fact-checking system. The researchers find households would be willing to pay the equivalent of NZ$3 a year in tax for the service (Jo et al. 2022).

While there is evidence for WTP for fact checking and agreement that misinformation has widespread societal costs, we do not include misinformation in the analysis. This is because the costs are experienced at the societal level, and a marginal increase in people being online does not necessarily increase the overall level of misinformation in circulation. Neither does misinformation necessarily come with direct costs to the internet user. This inability to allocate the costs of misinformation means we do not include them but recommend more work in understanding the scale of the costs and who they apply to.

Table 8 shows projections for the proportion of households and individuals without the internet in the home based on previous Census data and Stats NZ population projections. Here, we see digital inclusion increasing at a decreasing rate as inclusion approaches 100%.

The intervention is applied partly at the individual level (device access, skills training) and partly at the household level (internet connection).

Table 8 Proportion of population without internet at home projections

Year	Total population	Total households	Households	Individuals	Age 15–69
2021	5,128,600	1,910,400	10.4%	8.0%	6.5%
2022	5,173,200	1,933,000	9.3%	6.8%	5.3%
2023	5,222,400	1,955,100	8.1%	6.1%	4.6%
2024	5,271,100	1,976,900	7.4%	5.4%	3.9%
2025	5,319,400	1,998,500	6.7%	4.7%	3.2%
2026	5,367,100	2,020,000	6.0%	4.0%	2.5%
2027	5,414,200	2,041,300	5.2%	3.3%	1.8%
2028	5,460,500	2,062,300	4.5%	2.8%	1.3%
2029	5,505,900	2,083,000	4.1%	2.4%	0.9%
2030	5,550,500	2,103,300	3.6%	1.9%	0.4%

Source: NZIER based on Stats NZ Population Projections

Appendix E Costs and benefits of investing in digital inclusion scenarios

Table 9 The benefits of 'Strengthen'

Year	Time saving	Earning	Employability	Health	Social connection	Retail transactions	Government transactions	Cybercrime	Total
2021	$38	$95	$33	$8	$180	$95	$3	-$2	$451
2022	$34	$78	$27	$7	$155	$85	$2	-$2	$390
2023	$30	$68	$24	$6	$141	$75	$2	-$2	$347
2024	$28	$58	$20	$6	$126	$70	$2	-$2	$309
2025	$25	$48	$17	$5	$111	$64	$2	-$1	$271
2026	$23	$38	$13	$4	$95	$57	$2	-$1	$232
2027	$20	$27	$9	$4	$79	$51	$1	-$1	$191
2028	$18	$20	$7	$3	$69	$44	$1	-$1	$163
2029	$16	$14	$5	$3	$59	$41	$1	-$1	$138
2030	$14	$7	$2	$2	$48	$37	$1	-$1	$112
Total	$190	$368	$129	$38	$833	$478	$13	-$11	$2,048

Source: NZIER

Table 10 The costs of 'Strengthen'

Year	Device	Internet	Digital skills	Community	Total	Difference
2021	$26	$131	$44	-	$201	$250
2022	$23	$118	$38	-	$179	$211
2023	$21	$105	$34	-	$159	$188
2024	$18	$96	$30	-	$145	$164
2025	$16	$88	$27	-	$131	$140
2026	$14	$79	$23	-	$116	$115
2027	$12	$71	$19	-	$101	$90
2028	$10	$62	$17	-	$89	$74
2029	$9	$56	$14	-	$79	$59
2030	$7	$51	$12	-	$69	$42
Total	$122	$662	$202	-	$986	$1062

Note: Dollar amounts in millions. In this table, 'Difference' shows the benefit minus the cost.

Source: NZIER

Table 11 The benefits of 'Empower'

Year	Time saving	Earning	Employability	Health	Social connection	Retail transactions	Government transactions	Cybercrime	Total
2021	$56	$142	$50	$12	$270	$142	$4	-$3	$674
2022	$51	$118	$41	$11	$233	$128	$3	-$3	$581
2023	$45	$103	$36	$10	$211	$113	$3	-$3	$518
2024	$41	$87	$31	$9	$189	$104	$3	-$2	$461
2025	$38	$72	$25	$7	$166	$95	$3	-$2	$404
2026	$34	$56	$20	$6	$142	$86	$2	-$2	$345
2027	$30	$41	$14	$5	$118	$76	$2	-$2	$285
2028	$26	$31	$11	$5	$103	$67	$2	-$2	$243
2029	$24	$21	$7	$4	$88	$61	$2	-$1	$205
2030	$22	$10	$4	$3	$73	$55	$1	-$1	$167
Total	$285	$552	$194	$57	$1,249	$717	$20	-$17	$3,055

Note: Dollar amounts in millions. In this scenario, we assume the uptake rate is 75% and assign the benefits to 75% of the target population.

Source: NZIER

Table 12 The costs of 'Empower'

Year	Device	Internet	Digital skills	Community	Total	Difference
2021	$20	$99	$33	$50	$201	$381
2022	$17	$89	$28	$45	$179	$339
2023	$15	$78	$26	$40	$159	$302
2024	$14	$72	$23	$37	$146	$259
2025	$12	$66	$20	$33	$132	$214
2026	$10	$60	$17	$30	$117	$168
2027	$9	$53	$14	$27	$103	$140
2028	$8	$46	$13	$23	$90	$115
2029	$6	$42	$11	$21	$81	$86
2030	$5	$38	$9	$19	$71	$2,984
Total	$92	$497	$151	$251	$991	$2,065

Note: Dollar amounts in millions. In this table, 'Difference' shows the benefit minus the cost.

Source: NZIER

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