NZHiT
Enabling a Healthier New Zealand

NEW ZEALAND HEALTH INFORMATION TECHNOLOGY

Hauora, Mauri Ora: Enabling a Healthier Aotearoa New Zealand






An updated analysis of the Digital Health landscape of New Zealand.

digitalnation.nz

NZHIT
Enabling a Healthier New Zealand

Established in 2002 as a not-for-profit, incorporated society, New Zealand Health Information Technology (NZHIT) is recognised as the industry leader of the New Zealand digital health sector. Our membership represents the majority of digital health companies and organisations operating in New Zealand as well as a broad cross-section of healthcare providers, consultancies, legal, insurance, banking, Government, regional agencies, and international companies with a shared interest in New Zealand's Health and Disability Sector.

Our network brings together custodianship of nearly 100 percent of New Zealand's health related data, working collaboratively across the sector to position digital health technologies as a key enabler of quality health, social care, and wellbeing services. Our members make significant contributions, developments, and investments in innovative digital health solutions to enable the future direction of health delivery. NZHIT provides an open environment to support a co-ordinated, informed industry voice to maximise social and economic value for New Zealand through digital health technology.

NZHIT: World class health and wellbeing for all New Zealanders fully enabled by digital technology.

Thank you to all our Project Supporters

National Premium Project Partners

NZHiT Enabling a Healthier New Zealand

Ministry of Health Manatū Hauora

Spark Health

Gold Partners

Cerner

Dedalus

indici practice anywhere

medtech

Microsoft

Orion Health

Precision Driven Health

sysmex

wisegroup.

Silver Partners

Alcidion

AMS Simplifying Complexity

cemplicity

Clanwilliam Health

WEBTOOLS HEALTH

Whānau Tahi

Bronze Supporters

Aceso

Advantage Computer Solutions

Cereus health

Enigma Solutions

fraame healthcare

health point

HealthStream

iMedX

iMOKO Healthier Kids at Your Fingertips

leecare

Medical IT Advisors

medical objects

molemap By Dermatologists

Momentum Healthware

mycare

NOTED

novari health

Pharmaco Always from the heart

ProCare

RxOne

Ryman Healthcare

SECURELY

solnet

spritely

Tranzsoft Data Exchange Gateway

Sector and Industry Supporters

HiNZ Health Informatics New Zealand

HL7 New Zealand Partner

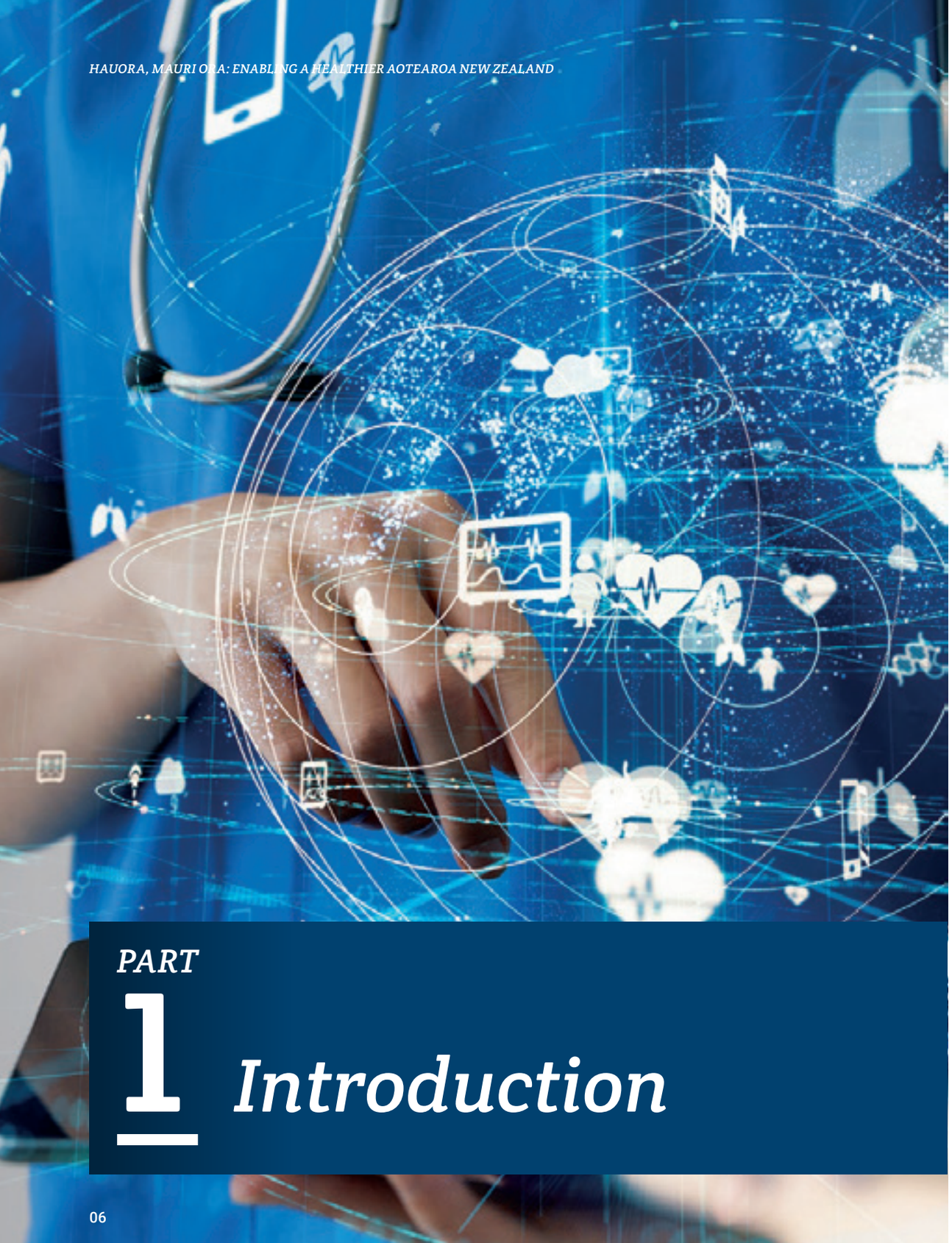
medical technology Association of New Zealand

NZTech

Patients First

tuanz

Contents



PART

1 Introduction

FOREWORD

New Zealand Health Information Technology

Today, there is an opportunity to recapture the position New Zealand once held as a global leader in digital health innovation. Together, we can enable improvement in the delivery of all healthcare services, helping address the issues of equity of access and equitable outcomes, while fostering a digital health industry that supports these changes, and is well positioned globally.

Kate Reid
CHAIR, *New Zealand Health Information Technology (NZHIT)*
Director of Digital Health, Deloitte

Digital health provides a unique opportunity to transform our health systems and services here in New Zealand, while concurrently creating new jobs and career opportunities for Kiwis that will help support New Zealand's prosperity. This 'moment in time' opportunity could see Aotearoa New Zealand create a health and disability system that will have the world eager to adopt our enabling solutions.

Currently, the New Zealand Health and Disability System is challenged with inequities in access to healthcare and in equality of health outcomes. Growing demand and consumer expectations, increased costs for new treatments and medicines, an ageing workforce, and the historical lack of investment in digital infrastructure are among the pressures highlighted by last year's *New Zealand Health and Disability Review.* At the same time, New Zealand has a burgeoning digital health industry, demonstrated by the more than 160 members of our industry association.

We are now beginning to witness significant shifts in the traditional models of care, from an almost total focus on providing healthcare, to wellbeing, consumer empowerment and the reduction in demand on our already stretched resources. While diseases and injuries will never be completely eliminated, we will be able, through science, data, and technology, to identify and diagnose earlier, intervene proactively through these new approaches, and better understand management and recovery pathways to enable consumers to more effectively and actively sustain their wellbeing.

It follows that a renewed focus on digital health presents us with the opportunity to enable, support and accelerate the changes the sector recognises as being essential if we are to move beyond an acceptance of the status quo and its implicit shortcomings.

However, in the absence of a truly cross-sectional forum for digital health, we believe the sector is constrained by the challenge of developing a fully co-ordinated nationwide strategy. This constraint is further compounded by a low level of digital literacy in the sector, systemic impediments to innovation, disabling procurement processes, and the slow progress being made to provide New Zealanders with equitable access to their health data and supporting technology.

NZHIT represents more than 160 organisations from across the sector, each with ideas, experience, and solutions that, if harnessed for the common good, would enable a step change in the health and wellbeing of New Zealanders. In this report we make a number of recommendations that would comprise the building blocks of this new digitally enabled approach to healthcare in Aotearoa New Zealand.

We believe that the implementation of these recommendations will require new governance structures to be put in place with clear accountabilities. Recognising that a great deal of strategy development is currently being undertaken within the sector following the *Health and Disability System Review*, we feel it would be inappropriate for NZHIT to recommend the structure, remit, and accountability of any new governance arrangements in this report.

We would simply note at this point that we see the Ministry of Health (MoH), working in collaboration with other Government agencies that impact on the social determinants of health, and with NZHIT representing the voice of digital health companies in New Zealand. Addressing the current fragmentation in our digital health landscape would require seats at the table for representatives from clinical, disability, Māori, consumer, private providers, and research organisations. This sector wide collaboration would enable the implementation and oversight of a national digital health strategy, including but not limited to, implementing the other recommendations of this report:

1. *Establish and operate a national Digital Health Innovation Network (DHIN) driving the uptake of innovative digital systems and services.*
2. *Develop and implement new procurement frameworks to enable digital investment decisions to be made and implemented more quickly and effectively.*
3. *Establish and operate a national Digital Health Academy (DHA) to fast-track health workforce digital literacy.*
4. *Promote digital initiatives that empower New Zealanders to take more control over their health and wellbeing, to help address the inherent inequities of the Health and Disability System, facilitating new more cost effective and appropriate models of care.*
5. *Work with other agencies such as New Zealand Trade and Enterprise (NZTE), to develop an integrated approach to take New Zealand's digital health solutions to the global marketplace.*

Throughout this report, we expand on these recommendations. We recognise the impact of adopting these recommendations will be profound and long term. These are not quick fixes, but time is of the essence. We need to act, and we need to act now!

This report is closely aligned with the key recommendations of the *Health and Disability System Review* and NZHIT welcomes the opportunity to work with Government to support the wider implementation strategy. NZHIT is committed to representing our industry and collaborating with other stakeholders for the clear shared goal of enhanced health and wellbeing of our fellow New Zealanders.

The Importance of Partnership

This is an important and relevant piece of work from NZHIT. Having had the privilege to contribute as a member of the Health and Disability System Review Expert Panel, it is clear that digital solutions and digital health is a foundational enabler within our health and wellness system and will increasingly play a vital role in helping us to solve some of our most urgent and biggest challenges.

The Review and our experience as a health system in the COVID-19 era has also highlighted the power and importance of partnership in the system. Our industry partners are valued members of the healthcare ecosystem. Importantly the role they will play as we continue to navigate COVID-19 challenges extends beyond the health system. It further highlights how closely health and economic prosperity are tightly coupled.

We have an opportunity to systematise and capitalise on the gains we have made over the last few months. **The recommendations put forward in this report are pragmatic and on-point.**

Dr Lloyd McCann

CEO and Head of Digital Health
Mercy Radiology and Clinics and Healthcare Holdings Ltd

FOREWORD

Ministry of Health

COVID-19 has shown how much New Zealand's Health and Disability System relies on digital technologies and data to support the best possible delivery of frontline healthcare and support services. It can literally be the difference between life and death, and wellness and sickness.

Shayne Hunter
DEPUTY-DIRECTOR GENERAL
Ministry of Health

It has also shown the importance of information for planners and funders, policy makers, and consumers. Finally, COVID-19 was a demonstration of the wonderful talent we have in New Zealand, the power of partnerships, and new ways of working.

The Organisation for Economic Co-operation and Development (OECD) reported in 2019 that "health data alone makes up 30% of the world's stored data". [1] The day-to-day effectiveness of our Health and Disability System is due as much to our use of data and digital technologies, as to medical technologies, drugs and laboratory tests.

The Government's 2020 *Health and Disability System Review* pointed out the urgent need to invest more in data and digital technologies.[2] This year the confluence of a number of developments provides a 'moment in time' opportunity to make a step change.

- As a country we are increasingly going beyond financial measures to track societal progress, and to consider broader indicators of wellbeing, including improved health status and equitable access and outcomes. The Government introduced a wellbeing approach across the Budget cycle in 2019, signalling wellbeing is at the centre of policymaking.[3] Digital technologies and data can play an important role in improving wellbeing outcomes.
- The Government recognises that the inequities implicit in today's Health and Disability System, particularly, but not solely, in respect to Māori and Pacific peoples, are unacceptable. The use of digitally enabled services and data must be a key part of New Zealand's strategy to address equity issues. Importantly, we need to engage communities in the design and implementation of services, and ensure everyone can participate, so that there is no digital divide.
- There is growing recognition that the system needs to aggressively invest in data and digital infrastructure and new ways of working. This is not only to relieve the burden of technical debt but to provide the opportunity to enable major advances in service delivery. It also provides a platform for New Zealand to be a global leader in public health service delivery and outcomes.
- The Ministry of Health (MoH) is leading the development of a national Health Information Platform (nHIP) ecosystem that will, for the first time, join up digital infrastructure across the New Zealand Health and Disability Sector. It will transform the creation, access to, and use of health information and digital services. In turn, this will support people to better manage their own health, wellbeing and independence, help improve the Health and Disability System's performance through operational efficiencies by delivering better data, and provide insights to drive the right actions. It will support flexibility and innovation which will underpin system transformation.
- There is stronger than ever interest in digital health. This is reflected in the number of new and entrepreneurial businesses establishing niche positions in our Health and Disability Sector and finding new markets offshore, complementing the success of established players, such as Orion Health. COVID-19, and New Zealand's response to it, is creating an increasing level of interest in what our country is doing in health and disability, potentially opening up exciting new opportunities and innovation funding for New Zealand-based businesses.
- New Zealand's highly regarded health research sector will increasingly be able to take advantage of a small but globally representative population, linked through the National Health Index (NHI) and nHIP, to attract overseas research and development (R&D) interest and investment.

Importantly, the Ministry of Health recognises the synergy between a health and disability sector that can meet the challenges of the 21st century and the nurturing of vibrant New Zealand-based digital health industry partners. This report is an important step in supporting this opportunity.

PLATINUM SPONSOR

Spark Health

Spark Health's vision is to 'Help all New Zealanders live healthier lives through the power of technology'. This vision clearly aligns with that of NZHIT and its members.

We also see digital technologies as key enablers of how health and wellness services can be transformed to meet and exceed the health and wellness expectations of all New Zealanders. The recommendations NZHIT set out in this report are necessary pillars on which to build a thriving digital health ecosystem. Communicating these ideas as a collective is a demonstration of commitment across the digital health industry and a key motivator for our sponsorship of this opportunities report.

As a New Zealand company committed to New Zealanders winning big in a digital world, we believe that the time is right and there is now more than ever, a unique opportunity for the local digital health industry to collaborate with other stakeholders in delivering world leading health and wellness outcomes.

The recommendations outlined in this report speak to issues that have permeated discussions across the sector for some time. The challenge, until now, has been the creation of an environment for true collaboration focused on developing a cohesive set of messages and goals that resonate widely — this has now been initiated through the completion of this report.

The COVID-19 pandemic was a wake-up call, notwithstanding that New Zealand avoided its full and terrible impacts. However, in its wake, we need to take the opportunity to build a health system that can weather these storms in the future. We believe that through adopting the recommendations in this report, not only can we build a more robust and effective health system, but we can also create a thriving export industry for digital health organisations.

Dr Will Reedy
CHIEF EXECUTIVE OFFICER
Spark Health

Looking ahead, we see huge potential for the local digital health industry to focus more broadly on the determinants of health and wellness for New Zealanders that exist outside the traditional paradigm of the health system. Essentially creating an environment where wellness is top of mind for all New Zealanders, where they have their own care team at their fingertips, wherever they might be and whatever form that might take.

Working in collaboration with NZHIT, the Ministry of Health and other key stakeholders to produce this report, we are in full support of each recommendation detailed here. It is indeed time for transformation, but that transformation needs to be well planned and well led and we stand to play our role.

Executive Summary

In today's world, digital technologies offer unique opportunities to strengthen health systems and help meet the increasing demand for healthcare and related services. The COVID-19 pandemic has forced those engaged in the health sector to urgently reconsider the way they work and to quickly implement new and innovative ways of working to better serve their communities.

In managing the risks and impacts of the pandemic, the role Aotearoa New Zealand's digital health companies have played, alongside the New Zealand Ministry of Health (MoH) and the broader sector, has shown that opportunity exists to make New Zealand a world-class digital health technology exemplar.

Working alongside Government agencies, we envision:

- The creation of a digitally enabled health and disability system for New Zealanders that delivers improved health and wellbeing outcomes for all.
- Digital technology enabling our people to take greater control over their health.
- An ecosystem that jointly promotes our people and our innovations, invests in, and attracts investment into, local digital health research and development (R&D).

We have the opportunity to enable New Zealanders access to more effective and equitable healthcare services. This can be achieved while growing a thriving export industry, creating jobs, boosting the economy, and supporting our post-COVID-19 economic recovery.

This report sets out a number of recommendations that offer the opportunity for real improvements to the health and wellbeing status of New Zealanders, showing how this can be enabled through investment in digital solutions, capitalising on the innovation potential of our digital health industry, and employment opportunities. Numerous case studies from across the sector further illustrate the successes and barriers in bringing digital solutions to the New Zealand Health and Disability Sector.

Our recommendations, detailed in this report, provide a pathway forward. The next steps include the creation of a governance framework, strategy, funding, and leadership to transform these concepts into a reality for all New Zealanders.

We recognise the need to unite the Health and Disability Sector, Government, the private health sector, NZHIT, and research institutions, to enable the development and implementation of an integrated strategy for digital health in New Zealand, while also recognising the value of the industry that enables it.

As the *Health and Disability System Review* recommended significant changes to the sector and included a focus on digital health, we are concerned not to pre-empt the implementation strategy that will follow. On this basis, we do not focus on the structure, remit or role of any putative organisation, rather the recommendations made in this report:

1 | *Establish and operate a national Digital Health Innovation Network (DHIN).*

- A partnership between the wider Health and Disability Sector and NZHIT.
- Dedicated to uniting healthcare providers, entrepreneurs and innovators, researchers and evaluators, and investors to focus on new digital technology solutions to address high priority needs.
- Regular competitive bidding for funding led by New Zealand based companies (in partnership with one or more healthcare or social agency providers), focused on the high priority health needs of New Zealanders.

2 | *The development of a more effective supplier engagement framework.*

- Reduce costs and eliminate delays in progression from established need to implemented solution. This will help address the current sector fragmentation.
- Promote provider/supplier partnerships to enable co-design and innovation, with fast and effective transition to full implementation.
- Refocus funding from capital to operating expenditure.
- Access the local and international expertise of NZHIT members to help inform and drive policy development.

3 | *The establishment and operation of a national Digital Health Academy (DHA) to accelerate digital literacy in the health workforce.*

- A nationwide collaboration between the Health and Disability Sector and our universities, based on existing work undertaken by Health Informatics New Zealand (HiNZ), the National Institute for Health Innovation (NIHI), and the MoH.
- Provide programmes to improve the digital literacy and skills of the entire health workforce.
- Provide clear pathways for the health workforce to engage in digital roles.
- Prioritise digital education within the syllabuses of all clinical training.
- Reward on-the-job digital capability skills uplift through professional development and foster clinical-industry internships or job placements.

4 | *Renewed focus on engaging and empowering consumers to address the issues of inequity of access and health outcomes.*

- Invest in digital solutions to enable more effective models of care which enable consumer choice, flexibility and informed decision making. For example, self-management, whānau-based navigator communities, one-to-many technologies, remote consultation, and hospital-in-the-home.
- Provide all New Zealanders with easy access to information relating to their specific health status.
- Ensure all consumer facing digital investments are secure, certified, and digitally inclusive.

5 | *Promotion of our digital health industry offshore.*

- Create a strong international brand for New Zealand as a leader in digital health.
- Promote our digital health companies in offshore markets, both individually and collectively.
- Work cohesively across agencies. For example, Ministry of Business, Innovation and Employment (MBIE), New Zealand Trade and Enterprise (NZTE), Callaghan Innovation, and the MoH to support the Digital Technologies Industry Transformation Plan (ITP).

To take full advantage of this opportunity, industry, Government, policymakers, clinicians, researchers, and communities need to collaborate for a shared vision and purpose.

Medical Technology

Medical technologies and devices are increasingly data dependent, software enabled and integrated. The breadth of Medical Technology includes reusable devices, implantables and equipment used in every setting across the health continuum. Increasingly new technology and incremental device improvements utilise digital tools to collect, interpret and store the data from devices to enhance diagnosis and treatment.

This intersecting of digital and medical technologies creates value in not only improved patient outcomes, but efficiency of care e.g., hospital workflow, remote patient monitoring, flexible equipment servicing, and device upgrades. “Increasing sophistication and reach of software enabled devices requires the expertise and confidence of healthcare workers to get optimal value from medical devices.”

Erin Currie

Chairperson
Medical Technologies Association of New Zealand

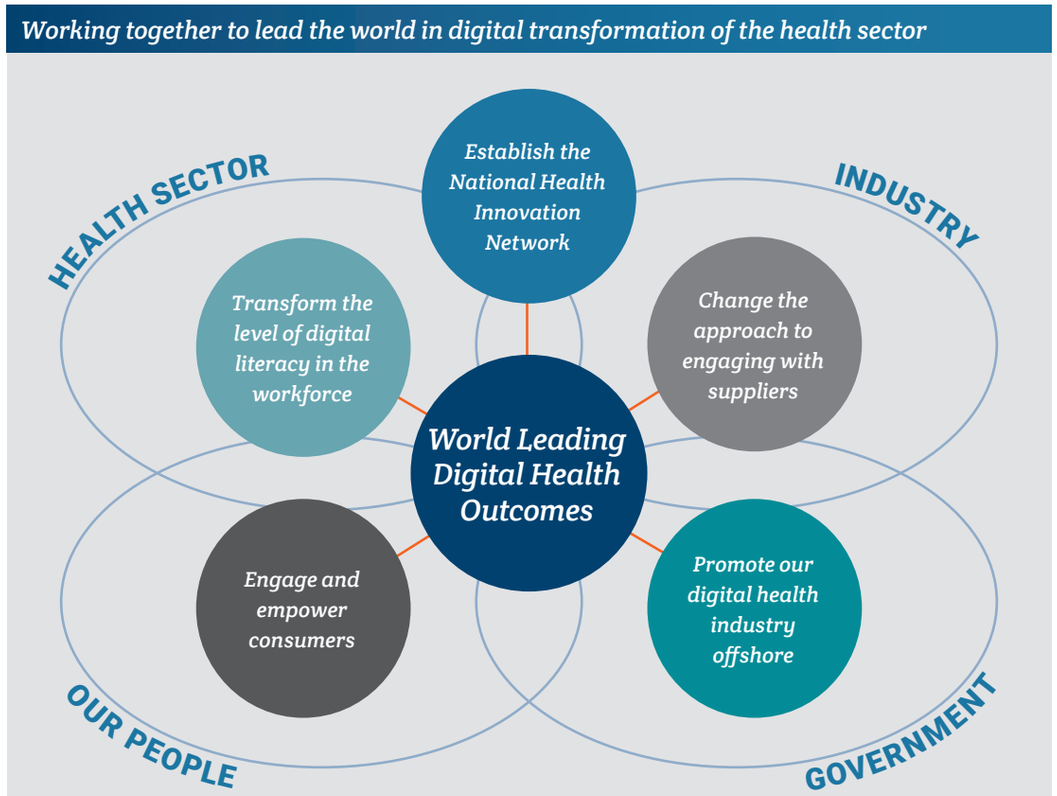


Diagram courtesy of Advanced Management Systems Limited (AMS)

Our recommendations are aligned with these current Government initiatives:

1. The recommendations of the *Health and Disability System Review*, in respect to governance, digitally connected services and the work of the Transition Unit.[4]
2. The recommendations of the Productivity Commission report, *Technological change and the future of work*, specifically in reference to fully realising "the potential of disruptive technologies for economic productivity and social prosperity." [5]
3. The work of the MoH in leading the development of a national Health Information Platform (nHIP), including interoperability, certification, and standards development.[6]
4. The report *Digital Skills Aotearoa: Digital Skills for our Digital Future*, analysing the current digital skills in New Zealand's workforce. This report highlights the need to significantly increase digital literacy and skills across all sectors in New Zealand.[7]
5. MoH initiatives aimed at enhancing the consumer experience through the development of applications with an increasing focus on consumer health literacy. [8] [9] [10]
6. The work of the Department of Internal Affairs (DIA) in conjunction with Digital Identity New Zealand and several Government agencies and organisations, including the MoH, in establishing the *Digital Identity Trust Framework*. Its aim is to "help New Zealand's transformation as a digital nation, where everyone can prove who they are digitally to organisations in a secure and trusted way." [11] [12]
7. *The Strategy for a Digital Public Service*, to enable digital transformation in the public service, growing the economy through digital innovation and improving New Zealander's wellbeing. [13]
8. The Ministry for Business Innovation and Employment and NZTech's *Digital Technologies Industry Transformation Plan (ITP)* recognising how "digital technologies will be vital for our future and economic wellbeing and will help drive future productive growth." [14]

In conclusion, we are currently presented with a unique opportunity to position Aotearoa New Zealand as a global leader in digital health innovation. Collectively, we can improve the delivery of all healthcare services while also addressing issues of equity, access, and health outcomes for all New Zealanders. Supporting the digital health ecosystem will also help create new jobs and career opportunities, further supporting New Zealand's economic prosperity.

PART

2 Our Healthcare

New Zealand Healthcare in 2021

Following our relative success in dealing with the COVID-19 pandemic, Aotearoa New Zealand has enjoyed a significant amount of positive global attention.

However, we know that New Zealand, as with all other OECD countries, continues to face major challenges in the sustainability of health and disability services, and the equity of their delivery.

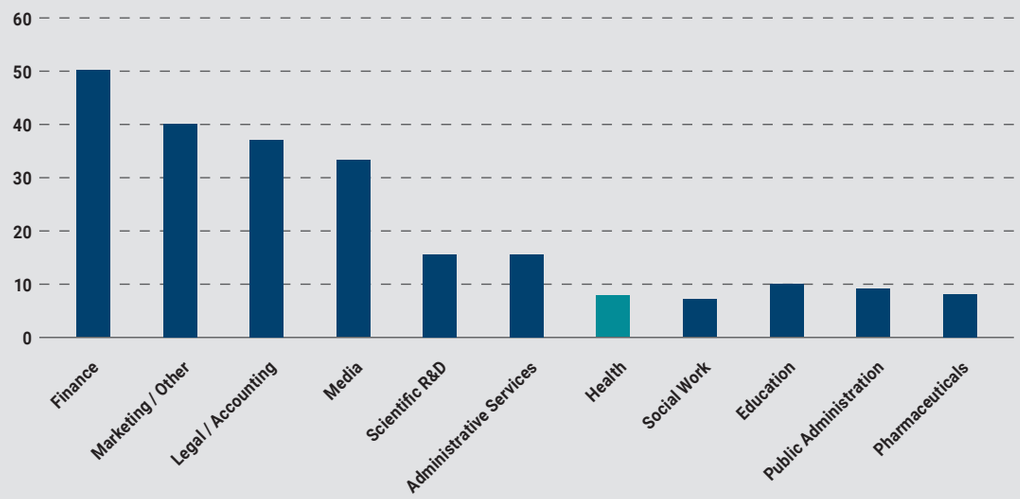
While life expectancy is increasing, rates of non-communicable and chronic disease are also increasing and many more New Zealanders now manage multiple health conditions.[15] The percentage of adults reporting good or very good health decreased 5.2 percent from 2013 to 2018. Meanwhile, adults with high levels of psychological distress increased two percent during the same time period.[16] As the cost of healthcare rises,[17] the demand for healthcare services is increasing faster than our ability to fund and resource the delivery of care. Due in part to historical paradigms, we struggle to scale the provision of services.

Better health has been shown to promote economic growth. A recent study by the McKinsey Global Institute examining COVID-19 global impacts on the economy and health, recognises that "better health promotes economic growth by expanding the labour force and by boosting productivity while also delivering immense social benefits. However, in recent years, a focus on rising healthcare costs, especially in mature economies, has dominated the policy debate, whereas health as an investment for economic return has largely been absent from the discussion." [18]

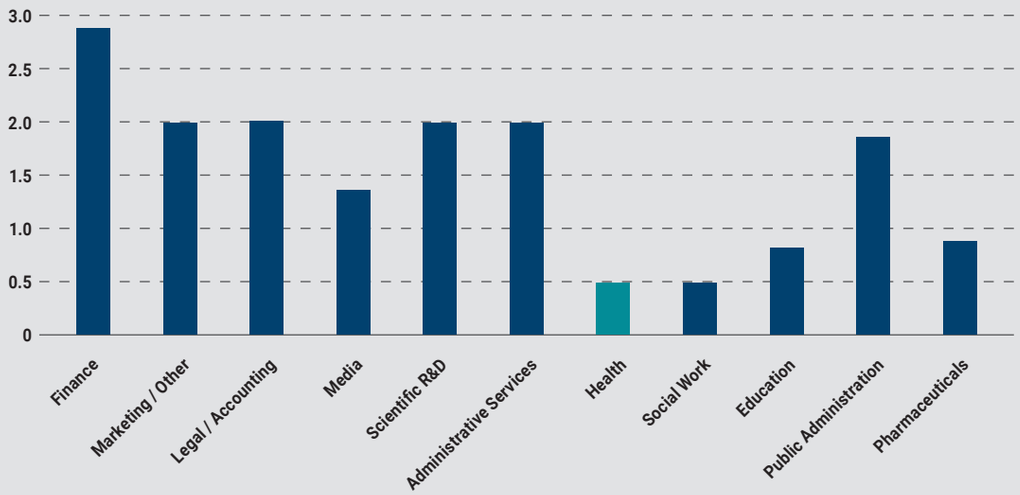
Scientific and technological innovation can help improve the health and wellbeing of the world's population by up to 10 percent and offers the promise of better planning and preparing for healthcare both for isolated crises (for example, the COVID-19 pandemic) and over the long-term, reports McKinsey.[19] In addition, the Global Digital Health Partnership (GDHP), a collaboration of governments and territories alongside the World Health Organisation (WHO), of which New Zealand is a member, recognises that the best use of evidence-based digital technologies will improve the health and wellbeing of citizens around the world.[20]

However, the OECD reports that health sectors invest far less in information and communications technology (ICT) than other sectors of the economy. They suggest the sector is at least a decade behind other sectors, which represents a considerable amount of missed economic and health benefits.[21]

Software and Databases % Gross Fixed Capital Formation (GFCF)



ICT Services % Output



An international comparison of New Zealand's resource intensity per hospital can be made using OECD 2018 data. Currently, New Zealand has 1.22 doctors and 3.8 nurses per bed compared to the OECD average of 0.75 doctors and 1.8 nurses per bed.[22] [23] [24] While New Zealand's resource intensity in hospitals is high, health expenditure per capita was just below the OECD average.[25]

While we should be cautious in making a broad interpretation of this data, as countries vary in their healthcare system contexts, we can question whether these resources have been effectively converted into improved health outcomes.

New Zealand continues to have high rates of cancer and diabetes, and Māori and Pacific Peoples experience ongoing disparities in health outcomes. In 2017, the Productivity Commission identified the importance of information flows in improving both health outcomes and measuring health sector productivity.[26] Additionally, the MBIE found that the delay in the implementation of new technologies can be a factor in reduced productivity.[27]

Our healthcare system is also influenced by other modern pressures. A significant proportion of New Zealanders live in socioeconomic deprivation and this is recognised as highly relevant in addressing health status. However, we have not been able to develop the interconnectivity necessary to achieve a more holistic approach.

Consumers are increasingly demanding greater access to and control of their health data, policy makers and managers are looking to stretch budgets through increased effectiveness and efficiency, and clinicians are seeking more timely and accurate support. All are seeking leadership to address these challenges with effective long-term solutions. In summary, Aotearoa New Zealand is a first-world country where too many of our people do not enjoy a first-class health system.[28]

The more than 160 members of NZHIT are convinced that digital health innovations and solutions can make a difference – this is their report.

Our Digital Health System

What is Digital Health?

"The field of knowledge and practice associated with the development and use of digital technologies to improve health. Digital health expands the concept of eHealth to include digital consumers, with a wider range of smart-devices and connected equipment. It also encompasses other uses of digital technologies for health such as the Internet of Things, artificial intelligence, big data and robotics." WHO definition.[29]

Digital health is the use of digital technologies and accessible data to improve health and wellbeing. This includes emerging technologies, for example, artificial intelligence (including chatbots and robotics), blockchain, the Internet of Things (IoT), nanomedicine, 3D bioprinting, virtual reality (VR), and more.

A health and disability system based on infrastructure leveraging new technology and fully utilising data has been identified as one of the three key enablers to system-wide improvement.[30]

The *Health and Disability System Review* outlines how "data and digital technologies – the ways of working and platforms required for a digitally enabled, information rich, data-driven system, and tools that are easy to use, inclusive and provide confidence to consumers and clinicians", will be a vital component of an efficient and effective health system.[31]

While there are many innovative individual technology solutions currently employed in the Health and Disability Sector, New Zealand is a long way from achieving the "digitally enabled, information-rich, data-driven system" advocated in the Review.[32]

Information Technology strategy, governance and asset management have been identified as operating at a basic level.

"The presence of legacy systems, incompatible devices and outdated infrastructure has created ongoing challenges for users to access and use patient and clinical information across both internal hospital locations and wider health service settings," says a 2020, District Health Board (DHB) asset management report.[33]

Previously, New Zealand has had an outstanding history of innovation in digital health due to the early introduction of a National Health Index (NHI) and the early adoption of digital Primary Care systems. Local startup companies collaborated with healthcare professionals to produce some of the world's most highly regarded solutions.[34] However, few have gone onto global success, and only a handful have managed to scale to a sustainable export business.

It is widely acknowledged that health systems remain 'data rich but information poor.' The OECD states the key barriers to building a modern health system are not technological. "The key barriers… are found in the institutions, processes and workflows forged long before the digital era."[35]

Not Welcome in New Zealand

ARANZ Medical (AML) is a healthcare informatics company that has been developing innovative technology-based solutions to improve healthcare since 1995. All of AML's research, development and manufacturing is conducted in Christchurch, New Zealand with 99 percent of sales exported to more than 40 countries.

The Silhouette suite of products first found success in international clinical trials, by enabling reliable, highly accurate measurements and images to be captured at distributed investigator sites and stored on a centralised server. Silhouette is now known in the industry as the gold standard for imaging, measuring, and documenting in clinical trials. To date, more than 160 trials have used Silhouette.

Silhouette is increasingly being used in telehealth applications, with the largest installation across 40 sites for the United States Department of Veterans Affairs, one of the world's largest healthcare providers, where AML has recently won a national contract in association with the major multinational, **Cerner**.

Meanwhile, procurement barriers have been so large in New Zealand, that for now, effectively all of the company's marketing focus is offshore, says CEO, Bruce Davey.

"The current fragmented use of digital technologies and silo systems is unsustainable."

Technical Working Group Update.[36]

In New Zealand, enabling a healthier Aotearoa is currently limited by the following:

- The devolved structure of the Health and Disability Sector leading to fragmentation, lack of scale, and hindered collaboration and co-operation.[37] [38]
- Different levels of Information Technology (IT) capability and readiness across DHBs and other providers.[39]
- A lack of consistent and effective investment in the development of data standards. This dramatically limits the ability of health providers to share data.[40]
- Healthcare providers often see IT as a cost burden rather than an enabler or strategic investment.[41] As a result, there is continual underinvestment in IT infrastructure.[42] For example, currently it is estimated that DHBs spend 2.3- 2.5 percent of their annual budget on digital products and services. It is estimated 90 percent of this is to support aged and outdated systems;[43] by comparison, the OECD average is closer to five percent.[44]
- Privacy laws and regulations are too frequently used as a reason to deny innovation.[45]
- Current procurement processes are slow, expensive and mitigate against innovation.[46]
- Relatively poor R&D spending compared with similar OECD countries.[47]

OECD Gross Domestic Spending on R&D % of GDP

	2017 (latest data)
Estonia	1.280
New Zealand	1.347
Australia	1.787
Singapore	1.919
Ireland	2.105
France	2.203
OECD Average	**2.342**
Denmark	2.732
Sweden	3.363
Switzerland	3.293

The National Health Information Platform (nHIP)

While some progress has been made at a regional level with several DHBs working together to provide a more integrated approach, these systems still do not provide nationwide solutions.

Currently, these systems have limited interoperability between healthcare providers with few interfaces between public and private providers. Despite recent advances, the public often struggle to access their medical data.[48]

Significantly, the MoH has recently taken a strong lead by announcing the development of the national Health Information Platform (nHIP). When implemented, this whole-of-sector ecosystem will provide a nationwide standards-based, interoperable and data driven foundation.

There is widespread support in the Health and Disability Sector for the nHIP, with some encouraging early signs of suppliers collaborating on integrated approaches to solution building.

The development of the nHIP presents major opportunities for New Zealand companies, specifically start-ups and small to medium enterprises (SMEs). A common, standards-based and interoperable ecosystem will certainly open the door to local innovation.

Certified systems will no longer have to join a queue (anecdotal evidence suggests this can often be five years or more) to be the next system installed at a DHB. New Zealand will enjoy a flexible, connected environment, where we can look forward to the next wave of digital health innovations.

Consequently, this will offer New Zealand the opportunity to be an international centre of excellence for digital health innovation where startup technologies are supported

and, in due course, enabled to go global. For example, some local companies including Orion Health, MedTech, and ARANZ Medical have shown what can be achieved. However, New Zealand needs many more innovative companies to flourish on a global scale, so economies of scale can be achieved. This will lead to significant benefits, both in revenue and productivity, for the country as a whole.

The Digital Health Opportunity

The New Zealand tech sector is a significant contributor to the local economy, creating many jobs and exports. The health technology sub-sector has considerable potential because of the well documented benefits of digital health and its related technologies.

"In the health sector, the potential benefits of digital technologies are abundant. Ensuring access to the right information by the right people at the right time can improve safety, effectiveness, and efficiency of care. Digitally enhanced health services can improve access and help move away from reactive towards proactive approaches to preserving health. Health workers could be relieved from time-consuming routine tasks and interact better with their patients. Consequently, people could become more engaged, improve selfcare skills, and more effectively coproduce health," [50] reports the OECD.

Aligning with New Zealand's current direction to improve the health and wellbeing of all New Zealanders, the WHO states that "the use and scale up of digital health solutions can revolutionise how people worldwide achieve higher standards of health, and access services to promote and protect their health and wellbeing." [51]

One of New Zealand's key advantages is our existing high quality health data, including our National Health Index (NHI). This NHI is a unique seven-digit identifier assigned to everyone who uses health and disability services in Aotearoa New Zealand. The NHI enables the exchange of patient information, providing an excellent foundation to develop a technologically enabled digital health ecosystem.[52]

New Zealanders have universal access to healthcare and its health system is largely funded (71 percent) by the taxpayer.[53]

"Technology is critical for the future prosperity of New Zealand and is the fastest growing segment of our economy, generating eight percent of our GDP and nine percent of our exports."

NZTech Annual Report 2020, Wellington, NZTech, 2020.[49]

Coupled with a national accident insurer, Accident Compensation Corporation (ACC) and a small population, New Zealand is well positioned to be an effective pilot model for full interoperability. The recent *Interoperability Roadmap: Accelerating the shift to a fully interoperable digital health ecosystem* from the Health Information Standards Organisation (HISO) proposes a two-year timeline to achieve specific goals related to interoperability, "accelerating the shift to a fully interoperable digital health ecosystem that enriches the experience for consumers and the health and disability workforce through better connectedness and use of information." [54]

Figure 1: The potential benefits of digitally-driven innovation in the health sector are abundant [55]

MORE EFFECTIVE, EFFICIENT AND PEOPLE-CENTRED SERVICES

Faster access to critical information.

More proactive approaches to preserving health and better patient involvement.

Clinical process optimisation.

MORE ACCURATE SURVEILLANCE AND ENHANCED RESILIENCE IN THE FACE OF CRISIS

Faster detection and better response to public health emergencies, e.g., the COVID-19 crisis. Better public health interventions.

BETTER HEALTH SYSTEM MANAGEMENT

Monitoring of health system performance.

Better resource allocation.

Enhanced planning and access to care.

POWERED-UP RESEARCH AND INNOVATION

Analysis of vast amounts of data for better diagnostics and treatments.

Real-world evidence for assessing long-term effects of therapies.

It Took a Pandemic

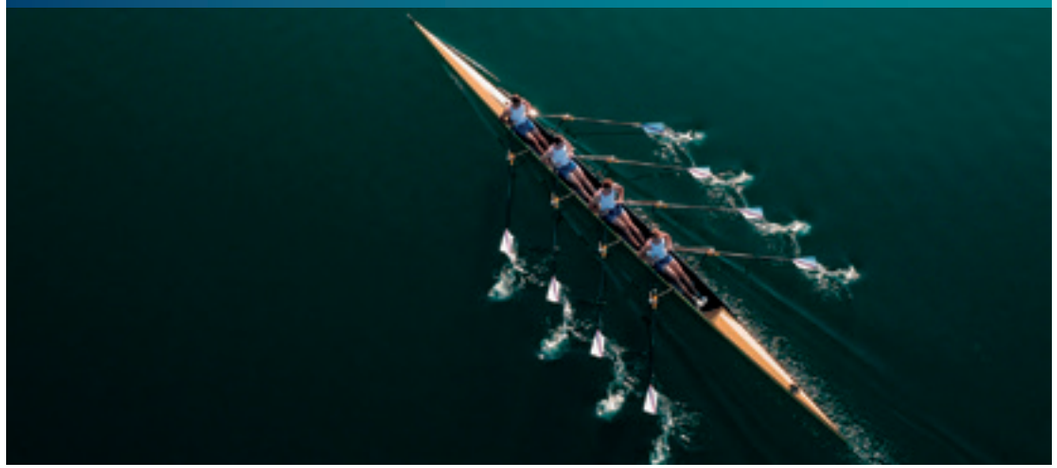
An example of fast, cost effective digital enablement is illustrated in the recent work by the MoH, the Institute of Environmental Science and Research (ESR), New Zealand laboratories, and the systems provider **Sysmex** in response to the COVID-19 pandemic.

The national notifiable disease centre, ESR, rapidly implemented Sysmex's Eclair Clinical Data Repository (CDR) as a single database for all COVID-19 results. There are eleven different reference laboratories across New Zealand that are performing SARS-CoV-2 PCR testing. Every time a COVID-19 test is performed, the result is sent directly via electronic means to the new Eclair system. The data integrates with New Zealand's contact tracing system and guides daily reporting by MoH executives.

To establish the single repository, decisions were made rapidly, including data and messaging standards. This process did not require a multi-represented committee and the standards were mandated for use by all involved.

If the same method could be applied for all laboratory and pathology testing, interoperability would be greatly improved. Consequently, a higher quality of data would be usable for multiple purposes, from population health to disease management.

Our national COVID-19 response showed how experts from different organisations successfully (and quickly) collaborated making decisions on standards and solutions to co-design and deliver working systems. This response also further highlights how we can be agile, dynamic, developing the best solutions, with the right teams at the right time.



PART

3 Recommendations

Recommendations

Digital technologies offer unique opportunities to strengthen health systems and help meet the increasing demand for healthcare and related services.

In managing the risks and impacts of the COVID-19 pandemic, the role local digital health companies have played, alongside the MoH and the broader sector, has shown an opportunity exists to make New Zealand a world-class digital health technology exemplar.

We have the opportunity to enable New Zealanders access to more effective and equitable healthcare services. This can be achieved while growing a thriving export industry, creating jobs, boosting the economy, and supporting our post-COVID-19 economic recovery.

Accelerating digital transformation requires strong clinical, technical, project and change management, as acknowledged in the *Health and Disability System Review.* [56]

The required hierarchy and accountability will need to be clearly defined, with the MoH adding significant value as a key stakeholder in providing leadership, policy, regulations, standards, and legal and national health frameworks.

Good digital health governance has been identified as the foundation for stakeholder co-ordination, uniting efforts and avoiding sector fragmentation. It also improves the functioning of health information systems to support broader health goals and can transform the way healthcare is delivered. Ultimately, good digital health governance enables a move from being care-focused to being actively health-focused.[57]

International evidence shows that due to the complex, technical, and multi-faceted nature of digital health, creation of a sector-wide governance structure is important.[58 59 60 61 62] However, this governance structure evolves, NZHIT seeks a place at the table working with the MoH, and the other Government agencies that have roles that impact the social determinants of health. We will collaborate with other stakeholders such as HiNZ, and clinical, disability, private provider, Māori, consumer, and research institution representatives.

An iterative agile development approach will enable us to respond rapidly to the emerging needs, priorities and goals of a national digital health programme. This approach will also help manage the risk of the complicated task of implementing an interoperable and connected digital health ecosystem.* Agile development also ensures efficient use of available resources, delivers value early, and provides fiscal savings as a result.[63 64]

As part of this movement towards a more collaborative approach to addressing the sector's challenges, NZHIT makes the following recommendations:

* Agile project management values and techniques allow project teams to work on smaller increments, review their work often, and include feedback right away to avoid costly failures. Agile government is inspired by agile software development. Agile government procedures reframe traditional decision-making by involving internal and external users as part of processes from day one and elicit continual feedback loops.

1 | *Establish and operate a national Digital Health Innovation Network (DHIN).*

- **A partnership between the wider Health and Disability Sector and NZHIT.**
- **Dedicated to uniting healthcare providers, entrepreneurs and innovators, researchers and evaluators, and investors to focus on new digital technology solutions to address high priority needs.**
- **Regular competitive bidding for funding led by New Zealand based companies (in partnership with one or more healthcare or social agency providers) focused on the high priority needs of New Zealanders.**

The Digital Health Innovation Network (DHIN) will oversee and enable the adoption of digital innovation within the Health and Disability Sector. Currently, our innovation ecosystem is fragmented, restricted, has high barriers, lacks strategic focus, and is underfunded.[65] [66]

The DHIN should reference proven international approaches. For example, the publicly funded, National Health Service (NHS) England has fifteen Health Innovation Networks (HIN) each serving a population roughly the same as New Zealand's. London's HIN has provided input in the development of this report and has offered to assist in establishing a New Zealand DHIN.

It is proposed that the DHIN will in due course merge with the Christchurch Health Innovation Hub and work closely with innovation partners such as Waitemata DHB's Leapfrog, National Institute for Health Innovation (NIHI), the Ministry of Awesome (MOA), and other sector innovation initiatives.

Although targeted at the health sector, the DHIN will, where relevant, liaise with Government agencies such as the Ministry of Social Development (MSD), ACC, and Oranga Tamariki (Ministry for Children) whose services collectively deal with our people's health, social needs and wellbeing. NZTE will also be a key stakeholder, providing marketing support to companies and establishing international beachheads. It is also vital the DHIN engages with the Non-Governmental Organisation (NGO) and community provider sectors.

The following diagram represents the NZHIT Innovation Lifecycle. Ideas are generated by established health technology companies or start-ups. Investment is made into a successful piloted version of the technology, evaluated by Government or institutions which in turn allows the company further development and reach of their product. This enables local and global market expansion, with reinvestment into the company to expand their products and/or services.

Harnessing International Innovation

The London ***Health Innovation Network*** (HIN) is the Academic Health Science Network (AHSN) for South London, one of fifteen AHSNs across England.[67] These are uniquely established to connect NHS England and academic organisations, local authorities, and industry, to increase the adoption of innovation across large populations.

The London HIN is an NHS team that works flexibly across the health and care sector, industry, academia, and in partnership with South London residents to accelerate innovation and improve care. It advises, supports, and connects teams to successfully adopt innovation.

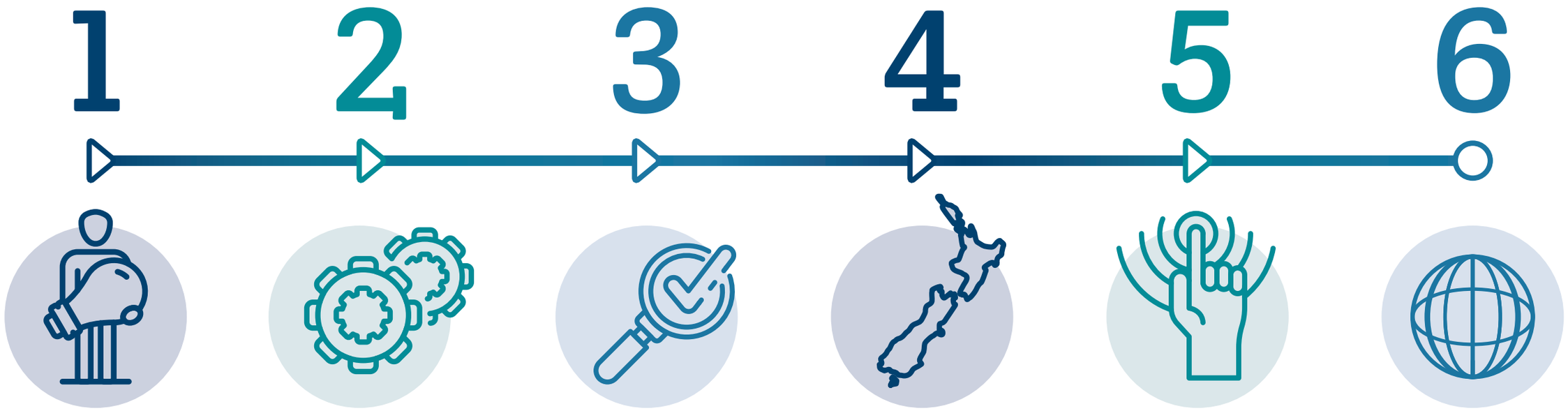
The ***Health Innovation Hub Ireland*** (HIHI) works across the health sector with Irish businesses to creatively solve problems and improve patient care.[68] Harnessing this innovation, through the development of new healthcare technologies, products, and services, it also creates new jobs and exports. Operationally, HIHI is a partnership of clinical and academic centres from across the country. It works directly with three hospital groups and the network can also access all acute and community hospitals, pharmacies, primary care centres, and healthcare centres.

The HIHI national team includes Health and Safety Executive (HSE) assigned staff from pharmacy to clinical research nurses and biomedical engineers. The team is further strengthened with members from academic and corporate backgrounds. The Government group tasked with overseeing HIHI – National Oversight Group – includes the Department of Health, the Department of Business, Enterprise and Innovation, Enterprise Ireland, eHealth Ireland, HSE, Infocom Development Authority (IDA), the Health Research Board, and Science Foundation Ireland.

In Asia, Singapore has also launched a new platform to make it easier and faster for healthcare institutions to implement new tech. Start-ups and SMEs will be able to test their innovations in the Centre for Healthcare Innovation Start-up Enterprise Link (CHISEL) sandbox, recently launched by the ***Centre for Healthcare Innovation*** (CHI).[69] Firms work with a healthcare institution to access real use cases for the trial, so their solutions can be customised to the local context and population.

The ***Health Tech Catalyst*** has been created in the United Kingdom (UK), to unite health care providers, technology companies and public sector organisations to collaborate on challenges, ideas and lessons relating to digital solutions. Its aim is to accelerate the flow of innovations deployed into frontline care; creating commercial opportunities for its participants and positively impacting the health and wellbeing of citizens. The initiative has a series of innovation accelerators to support businesses for example, a Business Surgery, Virtual Growth Labs to promote shared learning, and a service design to support ambitious fast growing start-ups and ventures, and designed to bring breakthrough ideas to market to achieve commercial success at scale.[70]

NZHIT Innovation Lifecycle



INNOVATE

Idea Generation

Conceptualise

Design

Collaborate and Partner (DHB, PHO, NGO etc.)

Bid for Innovation Funding

Feasibility Assessment

Showcase Benefits

DEVELOP

Research and Development

Proof of Concept

VALIDATE

Confirmation of Outcomes from Research

Testing

LOCAL LAUNCH

Embed in Processes

Productise

Investment to Expand Functions

Validate Benefits

LOCAL EXPANSION

Expand to Local Partners (DHB, PHO, NGO etc.)

Sustainable

Grow Staff and Business Operations

Prove and Enhance in a Variety of Situations

GLOBAL EXPANSION

Beachhead Strategy

NZTE Engagement

Further Investment

Global Market Rollout

The DHIN would oversee three specific and related digital health innovation workstreams:

- A National Accelerator
- An Innovation Launchpad
- An Evidence Generator

The proposed **National Accelerator** will:

- Oversee regular competitive bids for innovation funding.
- Award companies funding, based on the priority needs of the health system.
- Ensure that the business proposition is economically viable and offered opportunities in offshore markets.
- Provide clinical, managerial and financial advice of selected bidders.
- Broker collaborations with healthcare providers to act as early adopters for the innovation, as necessary.
- Encourage the formations of industry collaborations to solve health challenges.
- Mandate the use of international and/or New Zealand standards, when available.
- Encourage the participation of venture capitalists to provide funding.
- Promote the wider deployment of successful innovations to the sector.

Candidates will be encouraged to develop solutions with the potential to scale. This will help address the demand curve challenge, focussing on digital solutions that can transition from one-to-one to one-to-many models of care. Another potential area of focus is telehealth. The COVID-19 pandemic has seen a substantial adoption in the use of telehealth, but scalable solutions are required to embed this approach into mainstream care. Internationally, where the impact of COVID-19 has been considerably greater and is ongoing, similar, and more radical changes have become systemised and will likely remain in place in a post-pandemic world.

It is notable that COVID-19 has seen fresh impetus in some areas of innovation, especially relating to the adoption of telehealth. It is also notable that in some countries where the impact of COVID-19 has been considerably greater and is ongoing, similar, and more radical changes, have become systemised and will outlast the end of the pandemic. In New Zealand there are signs that these welcome innovations are being discarded now that the immediate crisis is in abeyance. It would indeed be ironic that New Zealand, held up as an exemplar of a health system in the fight against COVID-19, could see its relative digital health standing fall further below most other countries in a post-pandemic world.

Preference will be given to submissions targeting improved equity of access and outcomes, and addressing the issue of increasing demand. Examples of these areas of focus may include systems to support new community/whanau-based models of care or the treatment of chronic care patients in their homes. The aim is improving care for those with long-term conditions, while reducing demand on hospitals.

The proposed **Innovation Launchpad** will:

- Provide commercial and clinical advice, and training for companies, including first stage innovators, potentially working in collaboration with Callaghan Innovation to extend the Health Tech Activator to include digital IT and software solutions and companies.
- Provide formal regular reviews for selected innovators at first stage development.
- Connect innovators and industry partners with potential trial sites.
- Provide a 'sand-box' for rapid prototyping and collaborations.

The Innovation Launchpad will focus on working with individuals, start-ups and New Zealand based health IT organisations with ideas and early-stage prototypes. The Launchpad will offer organisations insights into the use, barriers, uniqueness, and viability of their concepts.

The proposed **Evidence Generator** will:

- Work with academic institutions to create standard templates for evaluating healthcare digital innovations.
- Evaluate early implementations of digital solutions. This will assist the sector in making procurement decisions and support companies in their ongoing solution development and offshore marketing.
- Vector with other initiatives, such as the Health Navigator assessment process for consumer related applications.

There are some notable examples of the engagement of academic institutions with health providers regarding research and evaluation agendas. Specifically, the Waitemata DHB Leapfrog programme, the National Institute for Health Innovation (NIHI) at Auckland University, and the Health Innovation Hub in Christchurch. However, further opportunity exists through the DHIN to instigate a locally delivered, but nationally designed approach to research and evaluation.

Better Experience for All

Aceso Health is a two-year-old digital health start-up with a mission to improve the experience of care for both patients and providers. They are focused on their work in New Zealand, while also taking their learnings and solutions offshore. Aceso's cloud delivered software integrates with the existing systems of their providers. It enhances their capability and functionality to help ensure patients are at the centre of their care journey.

"Digital is not a road, nor is it a destination. The system, our procurement, and the way we account for it must become more flexible. We must get comfortable with digital as an operational expense. We need an appetite for more risk, a willingness to try new things and become okay with the occasional failure," says Aceso CEO, Gabe Rijpma.

Creating Capability and Optimising Health

The **Precision Driven Health (PDH)** partnership is helping ensure that Aotearoa New Zealand harnesses the opportunity to build a consumer-focused, equitable health system based on data and digital enablers.

Launched in 2016, PDH has been building New Zealand's health data science capability through collaborations between health providers, universities, and IT companies. Their work has the complementary goals of empowering people to manage their own health, improving the equity and efficiency of the health system, and facilitating a thriving health IT sector in Aotearoa New Zealand.

Their research has delivered tools for machine learning management, to de-identify clinical data for research purposes without loss of valuable information; use natural language processing to search unstructured documents for valuable clinical information; and predict a range of patient specific outcomes.

The research partnership is focused on applying new data science techniques to understand data captured about each individual, in order to optimise the health of people and their whānau.

With support from the MBIE and commercial funding from Orion Health and others, **PDH partners with clinicians, researchers, healthcare providers, and other health technology companies to unite the sector in one of the most ambitious data science research initiatives to be undertaken in the Southern Hemisphere.**

The Partnership is investing $38m in data science research over seven years. It aims to make substantial contributions to both health outcomes in Aotearoa New Zealand, and commercial opportunities for the health IT sector. Since its inception, PDH has supported over 90 projects and 30 organisations. It has also been recognised by industry, winning the 2020 Visa Best Hi-Tech Solution for the Public Good Award for work on surgical outcomes for New Zealanders via the nzRISK tool.

The Partnership has made major contributions to New Zealand's COVID-19 response, providing the technology, personnel, and governance for Orion Health to support the Te Pūnaha Matatini disease spread modelling team, as well as the world-first New Zealand Algorithm Hub.

2 | *The development of a more effective supplier engagement framework.*

- **Reduce costs and eliminate delays in progression from established need to implemented solution. This will help address the current sector fragmentation.**
- **Promote provider/supplier partnerships to enable co-design and innovation, with fast and effective transition to full implementation.**
- **Refocus funding from capital to operating expenditure.**
- **Access the local and international expertise of NZHIT members to help inform and drive policy development.**

Traditionally, the process for acquiring digital solutions follows a purchaser detailing their requirements through their own channels and/or via consultants. This is followed by the Request for Information (RFI) and Request for Proposal (RFP) processes, leading to proposals, panel presentations and reference checks. Decisions are often made based on weighted decision metrics. In our view, the idea that procuring a complex digital solution can be based on the same methodology as procuring a personal computer or an air conditioning unit, does the sector and New Zealand citizens a major disservice. The traditional procurement approach commonly restricts the Health and Disability Sector's ability to optimise digital investments for a number of reasons:

- Purchasers are often not best positioned to define future requirements. Accessing local and global innovation at the definition stage can provide greater opportunity for success.

Historically, specific requirements have been used to create a contractually binding delivery specification. Current healthcare procurement does not reflect modern agile procurement practices and its evolution could focus on achieving a related success outcome.

- Assessments are often exercises in risk mitigation for decision makers. This often manifests in the choice of perceived safer options, most commonly a preference for larger international suppliers rather than smaller, more agile local providers.
- It is challenging to factor in the idea of a net New Zealand benefit. Anecdotal evidence suggests purchasing teams and probity officers often resist the idea of local collaborations, and the opportunities for further co-design and development.
- Purchasing exercises often fail to progress through lack of prior approval and/or funding allocations, leading to increased reluctance for future participation. In some cases, failures to proceed with procurement processes, are followed by decisions, with the associated costs and risks, to develop in-house alternatives.
- Increasingly, services will be provided in the cloud, with related opportunity for the iterative and agile enhancement of digital solutions. This approach will challenge the current structured business case processes. These will need to be modified to recognise appropriate long-term relationship frameworks, not simply a short-term return on investment of a single project.
- The transition to cloud-based solutions also provides the opportunity to move from an essentially capital funding approach for digital solutions to funding digital investments through operating expenses.
- Government procurement frequently requires a business case to secure funding and demonstrate measured risk and minimised uncertainty. Ideally, a business case is a tool to aid decision-making and includes an intergenerational view.
- Business cases assume all risks are known from the outset, which is an ineffective assumption. Successful digital transformation requires a "wider set of skills, primarily leadership of organisations and cultural change, organisational design, communications, and business insight." [71]
- *The Public Finance (Wellbeing) Amendment Act 2020* introduced new requirements for Government to report wellbeing objectives through the annual Budget and regular Treasury reporting.[72] These requirements embed the wellbeing approach into policy making. We encourage applying the wellbeing approach to procurement decisions, and consider values, not just fiscal cost.

The WHO Beats a Path to New Zealand Innovation

Florence is a 24/7 virtual health worker who provides digital counselling services to those trying to quit tobacco smoking and can share WHO public messages and recommendations on tobaccos and COVID-19 in conversational form.

Currently, there are over 1.3 billion tobacco users in the world, many wanting to quit but lack the support to do so. The COVID-19 pandemic has reduced the availability of face-to-face advice services usually available. To address this challenge, the WHO partnered with the New Zealand headquartered company Soul Machines, to develop the artificial intelligence health worker to support tobacco cessation during the pandemic.

Florence is programmed to hold a number of brief conversations with users through voice or text. She helps them take their first steps towards quitting tobacco, giving them the confidence to achieve their goals by creating a personalised strategy for quitting.

Using computer generated imagery (CGI) and animation, Florence delivers evidence-based advice commonly used in healthcare settings to help smokers quit. She has the unique ability to engage in real time conversation, can help users build a quit plan, and refer them to other digital services including toll free quit lines and apps. By using a standardised conversational guide, Florence only shares fact-based information.

Unlike chat bots, Florence engages in real-time emotional responses and uses facial expressions. She is able to process and respond to audio, visual and text information provided by users. Florence speaks six United Nations languages – Arabic, Chinese, English, French, Russian, and Spanish.

Additionally, Soul Machines has also created Sam, the COVID-19 Information Helper. Sam answers questions and information is continually updated. She is another example of how conversational artificial intelligence (digital people) can help across the sector.

Shutting the Door on New Zealand Suppliers

Wellington-based health and social care software provider, **Noted** offers an online client management system that allows health and social workers to efficiently share the care of people and whānau. All client notes can be shared and controls ensure records are only accessed by those who should. The company is committed to improving the lives of health and social workers, and the people they care for. However, Noted has been limited by standard procurement processes in New Zealand. As an example, a recent Request for Procurement (RFP) from a DHB was apparently looking for a solution that was Noted-like but included this 'essential' requirement:

"The proposed vendor must have successfully designed & implemented an AH (or similar) solution into an existing hospital of similar scale in Australasia."

Regardless of Noted's track record, they could not meet this criterion, so did not bid.

"While I feel we will continue to grow regardless, it is frustrating to observe organisations central to the care of New Zealanders, continuing to spend enormous sums of money trying to solve problems that I feel we have already made significant progress on."

Scott Pearson

CEO, Noted Ltd

Once nHIP enters the implementation phase, through the DHIN and the nHIP certification process, DHBs (and other public agencies) will be able to choose the best fit-for-purpose solution where, effectively all the preliminary validation work has been completed. Encouraging syndicated procurements will result in significant savings to the health sector and accelerate returns on digital investments.

NZHIT strongly supports the development of the standards underpinning nHIP and the provision of a certification regime, where digital solutions will need, as part of the submission process, to demonstrate their successful adoption of these standards, along with appropriate security and privacy provisions. Standard adoption and system certification will provide a rational approach to the sector's procurement processes at a local, regional, and national level.

In order to accelerate progress in these areas, NZHIT believes that standards development should be appropriately funded and governed, and that the costs of certification be shared between suppliers and government.

However, removing these barriers to procurement is only half the story. Too often, small New Zealand companies struggle to get their foot in the door at, for example, a DHB or PHO. If they do succeed with this first customer, it might be reasonable to assume that in a country of five million, other like agencies would be more encouraged to adopt. Regrettably, the opposite is often true, with an almost perverse desire by some agencies to choose alternatives or, in some cases, develop their own solution. In this latter case, systems can quickly become obsolete, difficult to maintain and in some cases consume significant budgets without ever being implemented.

Supplier Collaboration

Medtech have implemented a cloud-hosted interoperability platform – the Application Layer EXchange or ALEX. The purpose of ALEX is to provide a consistent, secure, managed, audited, and supported interface between Medtech, other Practice Management Systems (PMS), and third-party services that need to interact with that PMS. Nineteen third-party companies have already signed up to the service.

PMS's are mostly used by GP practices to maintain a reliable clinical record for patients and to support the day-to-day operations of the practice. The main end-users of a PMS are GPs, Practice Nurses, and other staff within a Practice (Practice Managers, receptionists etc). However, there are many wider aspects of healthcare that need to interact with that patient record and that touch on the day-to-day practice operations, but which are not part of core PMS functionality, including patient portals, shared care, insurance, mobility, specialised clinical functionality, diagnostics, and transfer of care.

To ensure compliance with international standards, ALEX will offer interfaces that comply with the HL7 Fast Healthcare Interoperability Resource standard (FHIR). **This will greatly enhance innovation in New Zealand and increase the opportunity for export of applications into other markets because of the use of international standards.**

New Zealand Technology Skills

Alcidion sees Auckland and New Zealand as integral to their expansion and attraction of talent. They have a development team based in Auckland that has expanded to include global testing and implementation resources. **New Zealand has supported the technology sector and fosters an environment that has allowed them to create a hub for development and support of their applications worldwide.**

Steve Lutz

General Manager, Business Development, ANZ

National Collaboration

Advanced Management Systems (AMS) has driven a collaboration resulting in the establishment of a National Framework for MECA (Multi Employer Collective Agreement) interpretation for DHBs. It has also initiated cross-sector user groups to advance the development of functionality, share learnings and best practice.

AMS views health as a uniquely people driven sector – creating a truly collaborative environment.

In practical terms it means solutions that prove effective for one organisation are designed to be scaled and made available for all. Some configuration and customisation may be required. However, a collaborative environment for continuous improvement, will drive savings and accelerate both productivity and technical competency.

3 | *Establish and operate a national Digital Health Academy (DHA) to accelerate digital literacy in the health workforce.*

- A nationwide collaboration between the Health and Disability Sector and our universities, based on existing planning undertaken by Health Informatics New Zealand (HiNZ), the National Institute for Health Innovation (NIHI), and the MoH.
- Provide programmes to improve the digital literacy and skills of the entire health workforce.
- Provide pathways for health workers to engage in digital roles.
- **Prioritise digital education within the syllabuses of all clinical training.**
- **Reward on-the-job digital capability skills uplift through professional development.**

NZHIT supports the establishment of a national Digital Health Academy (DHA) to significantly improve the understanding and use of digital technologies by the entire health workforce. Building on the work of HiNZ, NIHI and the MoH, it is proposed the Academy will oversee a number of initiatives including the implementation of a national digital health literacy programme in our DHBs, Primary Healthcare Organisations (PHOs), Non-Governmental Organisations (NGOs) contracted to provide health services, and in our tertiary institutions.

Digital technology is now an integrated part of our modern lives; from wearable fitness tracking devices, smart phones to social media, virtual meetings, and being able to instantly search for information. The COVID-19 pandemic has sped up a digitally capable world. With this increased uptake of digital technologies, it is vital our

Training Digital Leaders of the Future

Under the leadership of Dr Robyn Whittaker, Clinical Innovation Director for Waitematā DHB and Associate Professor at Auckland University's National Institute for Health Innovation (NIHI), the two organisations have co-operated to develop a Clinical Digital Academy (CDA). The aim of this programme is to train interested clinicians to be future clinical IT project leaders. It includes a week-long in-person course at the DHB that is taught by a range of local and international experts. Modules include health information systems, data and analytics, digital health design and evaluation, and leading clinical IT change.

Participants are deliberately multidisciplinary and from all parts of the organisation. At the end of the course, participants may be offered support for relevant projects, e.g., 12-month digital fellow roles in Waitemata DHB's i3 Institute for Innovation and Improvement, part-time secondments to projects/i3 or ongoing support to be digital champions in their services. An evaluation of the first CDA was published in the *New Zealand Medical Journal*, and the second round of the programme was completed in November 2020.

health workforce is fully capable, competent and confident in its use in the workplace. Digital literacy in the health workforce is the cornerstone of the integration of new and innovative technologies in the Health and Disability Sector.

What is Digital Literacy?

Digital literacy is commonly defined as the "capabilities that fit someone for living, learning, working, participating, and thriving in a digital society".[73] Increased digital literacy offers many benefits including increased productivity and efficiency; promotion of quality, safety, and continuity of care; improved clinical outcomes; and elimination of duplication.[74] [75]

Currently, the overall level of digital competency in our health workforce is well below what is needed to utilise digital health technology.

"While local initiatives are emerging, there is currently no clear framework or definitive strategy, goals or approaches to building digital literacy and capability across the Health and Disability System"

Health and Disability System Review.[76]

The OECD states that "Successful digital transformation in the health sector is not a simple matter of technical change but requires a complex adaptive change in human attitudes and skills as well as in the organisation of work and the related legal and financial frameworks. Digital technologies only provide the tools and cannot transform the health sector on its own but need to be put to productive use by the health workforce and patients."

OECD, Empowering the health workforce: Strategies to make the most of the digital revolution, (2020).[77]

It is crucial that the health workforce is able to be confident and competent in their digital skills, thus providing the best care to consumers, improving daily workflows, and giving the workforce the opportunity to participate in ongoing professional development to acquire this skillset, to stay relevant and expand their own career pathways in the future.

It is also crucial that effective leadership, targeted funding and change management is prioritised to increase our health workforce's digital literacy skills. Increasingly, our healthcare providers will be constrained by an ageing workforce and their ability to attract staff, because they are unable to offer a digital environment that is becoming the international norm.

There are currently no national programmes to enhance the digital literacy of our health workforce and limited pathways to incentivise clinicians to move into digital career paths.[78] In addition, there are limited formal processes to reward participation for on-the-job upskilling. Often clinicians are involved in digital transformation projects in addition to their full-time role as a healthcare provider. As a result, many senior managers have little understanding of the potential and the increasingly important role of digital technology in healthcare. New digital approaches to clinical decision support are not being prioritised because their potential is poorly understood. Legacy operating models can also be a barrier to the transition to new systems and new clinical roles.

In New Zealand, digital health is frequently only provided as an elective course in education or professional training, or taught as a standalone subject in many of our educational institutions rather than being integrated across health subjects.[79]

Although some DHBs have appointed Clinical Chief Information Officers (CCIOs), the role remains poorly defined and is not universally accepted. Meanwhile, in NHS England, the role of CCIO is standard.

A Clinical Perspective

The data and digital space is full of myth, mystery and disillusionment for many clinicians. The lack of a fully integrated electronic medical record, alongside the diversity of digital tools in different DHBs and private healthcare providers makes for a very poor experience at the delivery end of healthcare provision. Many clinicians feel let down as they watch digital tools in other workplaces being embraced, leaving patients and their providers behind.

With 2021 now upon us the COVID-19 pandemic has provided a reset button. The exposure of Aotearoa New Zealand's digital debt and poor digital literacy has sparked widespread meaningful collaborative discussions over the past 12 months.

These conversations on the future of digital healthcare were previously limited to enthusiasts, but with wider engagement there is hope for a future where collaboration across the sector is pivotal.

Clinicians throughout the country will be hoping that a focus on equity, an acknowledgement of the digital divide, poor digital literacy, and digital debt will continue to drive change. In particular the development of roles where clinicians can be actively involved in guiding and implementing change will be important. An industry group such as NZHIT provides a great opportunity to collaborate widely across the sector and their ongoing presence in the sector is most welcome.

Dr Ruth Large

Telehealth Leadership Group Chair & Co-Founder
Clinical Informatics Leadership Network (CiLN)

With the help of HiNZ, the Clinical Informatics Leadership Network (CiLN) have provided a platform for digitally focused clinicians to share ideas and experiences. However, a systemic framework is required to recognise the juxtaposition of healthcare and informatics.

The development of easily accessed, flexible, online, self-learning digital health programmes within our healthcare sector would help increase digital literacy of the health workforce. Creating a "modern and comprehensive digital health curriculum" is crucial to the successful uptake of digital technologies in our Health and Disability System and participating in digital literacy programmes will enable our health workforce to keep up with health demands, changing environments, and evolving technologies.[80]

The proposed Academy will develop a national framework for digital health training opportunities, including ensuring time provision is allocated to the health workforce to ensure upskilling is implemented. As a result, increased digital literacy will facilitate improved health outcomes, patient safety, inequities, continuity of care, and access to health services across the Health and Disability Sector.

4 | *Renewed focus on engaging and empowering consumers to address the issues of inequity of access and health outcomes.*

- **Invest in digital solutions to enable more effective models of care which enable consumer choice, flexibility and informed decision making. For example, self-management, whānau-based navigator communities, one-to-many technologies, remote consultation and hospital-in-the-home.**
- **Provide all New Zealanders with easy access to information relating to their specific health status.**
- **Ensure all consumer facing digital investments are secure, certified, and are digitally inclusive.**

Healthcare has yet to undergo the consumer driven digital revolution that has taken place in many other industries, for example retail, travel, and banking. There is a general lack of confidence in the ability for consumers to meaningfully access information regarding their health status and an acceptance that the balance of power is still tilted in favour of the provider. However, in recent years, by way of comparison, many consumers now routinely manage their financial affairs online. While there are some indications that this balance is now shifting, significant cultural and technological changes will be required both for consumers and healthcare providers to realise the potential of consumer driven healthcare. It is also acknowledged that a potential risk of some new forms of technological healthcare delivery may serve to increase the digital divide and exacerbate existing issues of inequity.

"People want to take greater control of their health."

OECD, *Health in the 21st Century: Putting Data to Work for Stronger Health, (2019).*

Chronic Disease Management

Around 300,000 people live in Lewisham in South East London, with about 15,000 recorded cases of diabetes and approximately 8,000 people estimated to be living with undiagnosed Type 2 diabetes. To try to identify some of these people, **Cerner** has been working with 13 GP practices that are responsible for 130,000 Lewisham citizens. These practices have been selected as they are the first in the area to share data through Cerner's *HealthIntent™*, a vendor-agnostic population health platform that allows health and care professionals to aggregate, transform and reconcile individual's data across the continuum of care.

In Lewisham, the intelligence platform has been able to discover people who have had two elevated HbA1c readings within a three-month period from across the system. This is vital to help those who are asymptomatic to start receiving education and treatment as quickly as possible. The algorithm searches for people over the age of 12 that have two HbA1c results of 48 mmol/mol or more within the given time span, and do not have a coded diagnosis of either Type 1 or Type 2 diabetes. Once the system finds people who meet these criteria, the information is fed back to individual practices via One Health Lewisham, the local GP federation.

Proactively knowing the identity of your patients, being able to engage with them and supporting them as they manage their condition are the key principles of population health management. By getting on the front foot to counter diabetes, health and care professionals will potentially be able to reduce the risk of their patients developing the complications associated with it.

In 2017, 3.7 billion health-related smartphone apps were downloaded globally, increasing from 1.7 billion in 2013. The proportion of adults seeking health information online more than doubled in the decade between 2007 and 2017. While the majority (70 percent) of OECD countries say they are implementing ways for people to access their heath data electronically, fewer than half (43 percent) include the ability for patients to interact with their own health records.[81]

In New Zealand, an increasing number of people are accessing their primary healthcare records online via General Practice (GP) portals, where they can order repeat prescriptions and review their test results.[82] An increasing proportion of the population are using wearable tech, such as fitness trackers, to monitor their key health indicators, and to alter lifestyle choices accordingly. People are also increasingly willing to share their wearable tech data with health and life insurance companies for personalised premium adjustments.[83]

Additionally, the COVID-19 pandemic has introduced the wider population to the concept of telehealth. Research shows that on the whole, they enjoyed the experience and having telehealth as a convenient option is something they would like to continue to have access to.[84]

Empowering Patients to Choose Their Care Provider

Homecare in New Zealand is largely a provider driven model with clients being offered very little choice in who cares for them. Typically, people who need care and support in their homes, want to choose the support they receive, where and when they receive it, and to know the person who is delivering the support.

Mycare is a social impact platform dedicated to connecting New Zealanders seeking support and those who provide support. Mycare is a New Zealand based social value company built as an alternative to the traditional model.

While consumer driven service models have seen huge success in hospitality, transport, financial, and travel industries, Mycare reports uptake has been slow. **It is largely dependent on private paying consumers who have a personalised budget, which risks creating or exacerbating inequities.**

e-Mental Health Solution Helps Address Workforce Issues

In 2019, the **Wise Group** launched a new digital service, Just a Thought, to enable all New Zealanders to have free access to evidence-based Cognitive Behavioural Therapy (CBT).

The system offers CBT online and is designed for people with mild to moderate symptoms of anxiety and depression. It provides equitable access to mental health support, teaching people how to control their emotions, thoughts, and behaviour to improve their wellbeing.

Within its first eighteen months, Just a Thought attracted over 23,000 registrations from the public, and clinicians seeking to prescribe the tool in practice. **Just a Thought has established many integral partnerships, however several challenges have been identified. Challenges include the regional and service-to-service differences in willingness and ability to implement e-Mental health as a part of routine care. This is impacted by differing levels of workforce digital literacy, awareness of e-Mental health solutions and a lack of strategic funding.** Likewise, integration is currently limited due to the number of different Patient Management Systems (PMS) in use, although it is recognised that the development of nHIP should address this barrier.

Despite these challenges, registration numbers continue to grow, and an increasing number of services are utilising the tool as a treatment option.

Some GP practices in New Zealand are continuing to offer telehealth services. However, in comparison, an estimated 99 percent of GP practices are offering patients the option of remote consultation in England, in response to the COVID-19 pandemic.[85]

We support the work of the *Digital Inclusion Action Plan* towards a digitally included New Zealand, particularly for digitally disadvantaged groups, affordability of devices and internet services, and ensuring people can access government services.[86] Collaborative initiatives, such as the zero-rated data pilot "No credit, no worries", need to be rolled out more widely to facilitate equitable access to health information.[87] [88]

The MoH's nHIP programme recognises the importance of empowering consumers by making available portals and online applications that connect them more effectively to their care providers and provide them with their health information. New whānau-based models of care also require technology support to enable the interaction between people, their families, community organisers, and healthcare professionals.

Personalising Healthcare

Personalised Healthcare (PHC), connects medical science, digital technology, and data science. It enables treatment and care to be individually tailored and can create opportunities for patients, populations, physicians, researchers, and health systems.

Meaningful big data is critical to PHC's success, including taking into consideration unique biologic traits and lifestyle. It begins with the collection, aggregation, curation, and analysis of patient-level data from many different sources, including electronic health records, advanced diagnostics platforms, and digital tools, as well as disease registries and patient reported outcomes.

"Meaningful big data has the potential to bring innovations to patients faster. Real world evidence can guide regulatory decisions by providing context, justifying unmet medical need, and demonstrating safety and effectiveness in new populations.

PHC presents specific opportunities for patients where growing populations, increased disease burden, and widening health inequalities present specific challenges."

Angela Pantano

Director Access and Public Policy
Roche Products New Zealand

Navigating the Māori Worldview

Whānau Tahi was established in 2011 to translate Māori principles of whānau-centric healthcare into an online platform. It aims to empower patients with greater visibility and control throughout the health treatment process.

Whānau Tahi's is a shared care programme, driven by the vision of fully connected, data-driven patient pathways, where health and social impacts are measurable. It operates in support of Te Whānau o Waipareira and other providers under the Government's Whānau Ora (family wellbeing) intervention programme.

Central to Whānau Ora's approach is the role of the Kaiārahi or Whānau Ora Navigator. They work closely with whānau, identifing their specific needs and aspirations, connecting them with the support they need to achieve their goals. Kaiārahi have the cultural and local knowledge necessary to appreciate whānau situations and build relationships of trust and confidence.

Whānau Tahi places individuals in control of their own wellbeing journey, cultivating family-driven outcomes and helps enable systemic change. Agencies and service providers can easily track the progress of the people they serve and more effectively measure their impact.

The work of Kaiārahi is supported by IT solutions provided by Whānau Tahi including an integrated case management platform, built on a whānau-centric philosophy. Providers are able to configure their system to their specific needs, including development of dynamic views of information and reporting needs.

In responding to the COVID-19 pandemic, a dynamic platform meant Whānau Tahi were able to release IT solutions for immediate deployment to DHBs, GPs, pharmacists, community-based support workers, and Whānau Ora providers. The Navigator interface was also adapted to include 'hot buttons' for categorising whānau who were symptomatic, self-isolating, diagnosed, and had been supplied a hygiene and sanitation (HAS) pack.

Dashboards including mapping tools, provided visibility on the number and location of whānau who received HAS packs from Whānau Ora providers throughout Te Ika-a-Māui (North Island). All health and support workers engaging with whānau automatically received whānau status alerts when accessing records. All clinical workers and other authorised users also had access to whānau status information. This helped clinicians assess appropriate COVID-19 treatment, alongside relevant advice for appropriate follow-up and care.

The solution created has gained popularity and has proven its value both locally and internationally.

Technology is enabling increased and improved collaboration between individuals, and those that care for them. For this reason, digital inclusion, improved connectivity and better IT infrastructure are crucial to provide better access to accurate and timely health information and services.

There is an increasing use of apps and telehealth to support people experiencing mental distress. This is offered as and when help is needed, rather than through clinician-centric appointments.[89] For example, Homecare Medical is notable in pioneering the creation of one-to-many care systems. The ability to scale solutions, using web avatars, text and video with curated information are key to addressing the ever-increasing demands for healthcare and related services.

Attention must also be given to the diverse disability population and their accessibility needs. Some digital initiatives may exclude those with disabilities, further widening the digital divide. For example, online technology's reliance on written communication presents a barrier to those with reduced literacy or sight. Alternative mediums need to be considered to access information online.

The Disability Sector

Within individual parts of the Disability Sector, the digital divide creates challenges for disabled people. Suboptimal care can be delivered to disabled people because important information essential to provide the right care, at the right time, is not available.

The National Health Index (NHI) is the single biggest strength of the New Zealand Health and Disability System, however the NHI is not used exclusively across the system. Consideration should be given to expanding this across related sectors

"The long-term goal in the transformation of the Disability Sector is that disabled people will have control and choice over how they receive their support. Among those choices, personal budgets are a mechanism strongly supported by disabled people and families. **Digital and other improvements that are being planned to roll out connected information platforms in the Health and Disability System must be key enablers for this vision,"** says Sonia Hawea, Chairperson Needs Assessment Service Coordination Association (NASCA).

Helping Patients Access Support

Homecare Medical provides anonymous, brief-intervention phone support, where callers can then be referred to another service option for further support. In collaboration, Homecare Medical and **Healthpoint** developed the national mental health and addictions directory (MH&A) as a resource to support helpline operators and public users to find services more easily.

Together, Healthpoint and Homecare Medical are supporting 200,000 people in mental health or addiction stress to connect with a trained professional for direct support and with the further ability to refer them to a provider who can manage their on-going needs, when necessary.

Combining a source of qualified information via patient portals with personal support programmes connecting a patient with the consequences of their actions, will see a significant improvement in New Zealand's overall health status. This can be achieved through digital health by empowering people to understand their health conditions, participating in their own care and treatment, and being able to communicate with their healthcare team more effectively, resulting in the improvement of the individual and collective lives of New Zealanders.

Collaborative Content Creation

The **Health Navigator Charitable Trust** is working with partners, including **Kidshealth NZ** and **HealthInfo Canterbury**, to create a national health content hub. The hub will host trusted, New Zealand focused, quality health content and self-care resources.

Content will be submitted to the hub by approved content partners and overseen by a national editorial team to ensure principles, quality standards and equity focuses are maintained.

The creation of content as a service will enable seamless sharing and updating of information across platforms, so organisations can repurpose the content for their specific needs and audiences.

The hub also offers improved access, acceptability, and applicability, to more equitable outcomes for Māori, Pasifika, people with disabilities, and other high needs populations.

"The Trust and its partners believe the sector could do a much better job if there was a national collaborative working together and focused on putting equity and whanau first," says Dr Janine Bycroft, Executive Director, Health Navigator Charitable Trust.[90]

Consumer Model of Care Use Case

New Zealanders treated for cancer spend most of their time at home, managing side effects themselves through often toxic treatment regimes. **Research shows that more than 50 percent of these side effects go unreported by patients to their clinical teams, with Māori and Pasifika even more reticent to be seen as 'complaining' to their healthcare providers. This lack of information flow results in patients either invalidating themselves for further treatment or dropping out because they cannot bear the side effects any longer. This, in turn, leads to poorer quality of life, and for some patients, an untimely death.**

Utilising new research out of the USA, **Cemplicity** partnered with Breast Cancer Foundation New Zealand to allow breast cancer patients to report frequently about their side effects remotely, and automatically alerts nurses when certain thresholds are reached. The nurse here is able to take the load off oncologists to proactively manage patient symptoms better, keeping them in treatment longer, saving lives.

This solution is live today at Waikato DHB where nurses are actively managing alerts and triaging side effects as soon as the patient reports them, in real-time. Every DHB in New Zealand can access this solution, however, the opportunity to build awareness and navigate procurement primarily lies with one-on-one conversations with various stakeholders in each DHB. **The lack of a cohesive national framework to promote great new models of care is felt acutely here – the absence of which inhibits speedy evaluation and adoption across the public health network at the expense of cancer patients.**

5 | *Promotion of our digital health industry offshore.*

- **Create a strong international brand for New Zealand as a leader in digital health.**
- **Promote our digital health companies in offshore markets, both individually and collectively.**
- **Work cohesively across agencies. For example, Ministry of Business, Innovation and Employment (MBIE), New Zealand Trade and Enterprise (NZTE), Callaghan Innovation and the MoH to support the Digital Technologies Industry Transformation Plan (ITP).**

New Zealand is a world leader in the primary sector, with our leading exports being dairy, meat, wood, seafood, and wine products. However, we are also a world leader in service exports, with telecommunications, computer, and information services totalling $1.39bn in 2019.[91] This sector has seen rapid growth over the past five years and there are considerable opportunities to increase our share of the market with our largest trading partners, including the USA, Australia, and the UK. To maximise the opportunity, the sector needs ongoing, targeted support from key Government agencies, including NZTE and the Ministry of Foreign Affairs and Trade (MFAT), ensuring our digital health sector is promoted in offshore markets, with New Zealand being seen as a world leader in digital health solutions.

New Zealand has an emerging reputation in digital health and is in a strong position to provide innovative and agile digital health products and services. NZTE has had a long-term and productive relationship with our digital health industry. For many years NZTE organised collective participation in major overseas trade shows, providing guest speakers and assisting in the development of relationships with international decision makers.

However, in recent years, the promotion of New Zealand as a digital health solutions leader has been lost. Currently, several NZHIT members have a strong offshore presence, often in contrast to the New Zealand domestic market. A number of companies have enjoyed considerable success internationally, but there are many more, with the right support, who could showcase the New Zealand digital health brand to the world.

The development of nHIP and the creation of a vibrant innovation landscape, will provide the opportunity to create a powerful New Zealand digital health brand. It is proposed that NZHIT and NZTE develop a strategy to take to industry and into global markets, including the development of marketing collateral to demonstrate the strength of our industry.

Working with NZTE to establish the New Zealand Digital Health Brand will encourage NZHIT members to work collectively and collaboratively to develop demonstrations, to commission collateral (e.g., videos) and to take our story to the world. Recent successes by New Zealand companies working together in places like Saudi Arabia offer proof statements of the opportunity on offer.

New Zealand Companies Can Go Global

Orion Health, a global company headquartered, and with its primary R&D base, in New Zealand, is one of the New Zealand technology sector's great success stories. **Founded on the basis of a collaboration with Counties Manukau DHB, Orion Health employs more than 500 people in 20 offices across 13 countries. Their health information platform is used by hundreds of thousands of clinicians across the globe to manage the healthcare of more than 100 million patients in 55 large-scale solutions across 15 countries.**

More recently their partnership with **Southern Cross Healthcare** has seen the development of their Hospital Electronic Medical Record and consumer facing Digital Front Door systems. Some recent export successes include:

Oklahoma Health Information Exchange ($100M Total Contract Value)
Awarded to Orion Health to implement its Health Information Platform for the State of Oklahoma for its 5.5 million citizens. Orion Health is responsible for providing the technology and operating the Health Information Exchange including connecting Oklahoma State's hospitals and clinics and supporting their ongoing access to the platform.

Malaffi Health Information Exchange
Orion Health implemented its Health Information Platform in the Emirate of Abu Dhabi for a population of three million citizens and expatriates. The solution was delivered in twelve months and has now connected more than 900 participating hospitals and clinics, which comprises 85 percent of the total providers in Abu Dhabi.

COVID-19 Outbreak Management Solution
This technology provides remote patient monitoring for chronically ill citizens to enable healthcare provision at home instead of in hospital. This keeps high-risk patients away from hospitals that are already overwhelmed with COVID-19 patients, keeping precious resources available for those who really need them. The solution has been sold and implemented in Quebec, Canada, and French Guiana.

"New Zealand is a fantastic place to develop world leading solutions. We are fortunate to have access to very talented people, both in our client partners and, of course, our employees. It's very satisfying to solve complex healthcare problems here for the benefit of New Zealanders, and to be able to share that knowledge and the resulting solutions worldwide," says James Rice, Global Director for Orion Health.

International Exemplars

Singapore is experiencing rapid growth in startup companies developing digital health tools. In January 2020, Singapore's Ministry of Health announced that the telemedicine sector would officially be licensed before the end of 2022. The Infocomm Media Development Authority (IMDA) and Enterprise Singapore (ESG) expanded a range of pre-approved digital solutions to help healthcare SMEs deal with the COVID-19 pandemic by providing virtual health consultations to serve increased demand. These solutions include significant subsidies and grants.[92]

Finland is one of ten countries exporting more health technology than they import. Estimates show there are approximately 500 companies active in Finland's health sector, which employs 20,000 people. Finland has invested in their health sector for decades, supporting growth companies via various funding programmes. The sector has a strong foundation in research, product development, and innovation, which require specialised competencies. Close partnership between the public and the private sector is at the core of the development. The Finnish Government is also considering digital health as an important sector for the country's future economic growth.[93]

Estonia is widely considered to be the leading eHealth country in Europe. [94] It has a nationwide eHealth infrastructure with data spanning a decade, a high adoption rate of eHealth services by consumers and healthcare providers, and a high level of trust towards e-services. Estonia has established the Tehnopol Startup Incubator Program which supports start-up companies in a six-month programme aimed at boosting fledgling companies to a sustainable revenue.[95] [96]

Denmark's health ecosystem has been at the forefront of digital integration for twenty years. It is one of the most digitalised economies and societies in the European Union (EU) and is the number one European country for digital competitiveness. Denmark has a long tradition for interdisciplinary cross-sector collaboration and systematic public/private innovation. It is considered an ideal sandbox for testing new technology and business models to the healthcare sector and scaling them globally. [97]

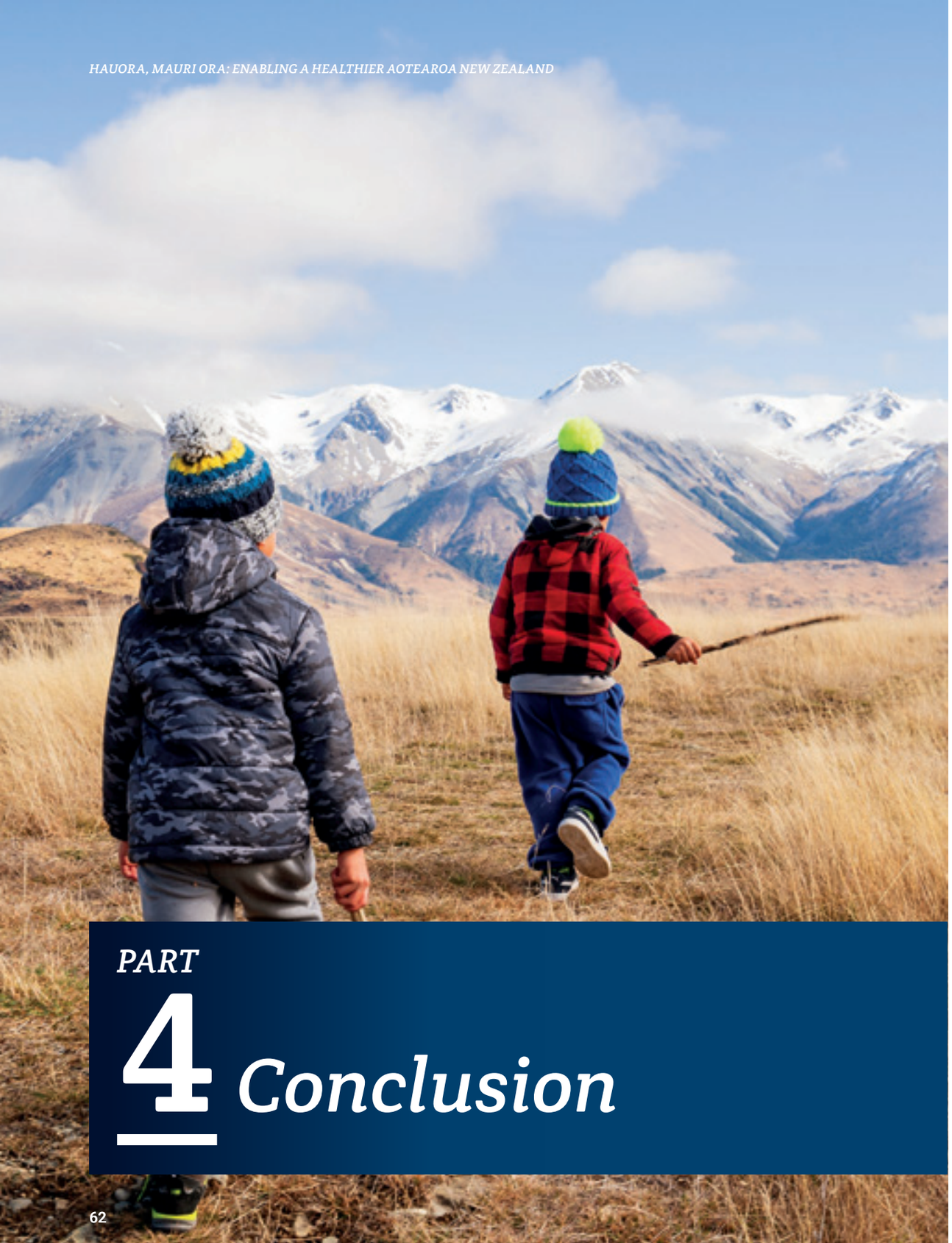
A View From the Sector

In the New Zealand Health and Disability Sector collaboration needs to be cross-disciplinary – Clinicians, technologists, vendor partners, providers, and service users. Co-design and user experience are the key to successful technology adoption; therefore, New Zealand health IT companies need to ensure they establish mechanisms to engage with end users to understand how they will use their solutions in the real world of consumers and/or clinicians. Building something in an R&D environment without input from end users is a recipe for disaster.

"Collaboration in my view needs to be cross-sector/industry – what can be learnt from MTANZ, AgriTech and others? After the earthquakes, in Christchurch we learnt how important industry collaboration is and how it can help utilise capability within a broader community to support health outcomes. Collaboration amongst the New Zealand vendor community and the international players is also essential – no one company has all the solutions. Therefore, working together to deliver a seamless interoperable solution makes sense. It also provides an opportunity for scaling innovation and supporting economic success for the New Zealand health tech sector."

Stella Ward

Executive Director Cloud Programme,
Department of Internal Affairs
(Previously, Chief Digital Officer, Canterbury and West Coast DHBs)



PART

4 Conclusion

Conclusion

In conclusion, we are currently presented with a unique opportunity to position Aotearoa New Zealand as a global leader in digital health innovation. Collectively, we can improve health outcomes and the delivery of all healthcare services while also addressing issues of equity of access, equitable outcomes, patient safety, and continuity of care.

This report shows how digital health can improve more equitable access to health and disability services while growing a thriving export industry. Supporting the digital health ecosystem will also help create new jobs and career opportunities in the health sector, further supporting New Zealand's economic prosperity.

Our recommendations offer improvements to the health and wellbeing status of all New Zealanders. The report also shows how this can be enabled through investment in digital health solutions, capitalising on the innovation potential of our digital health industry and offering employment opportunities in the health tech sector.

To take full advantage of this opportunity, Industry, Government, policymakers, clinicians, researchers, and communities need to collaborate for a shared vision and purpose. NZHIT's 160+ members, employing 1000's of New Zealanders and providing the engines that drive innovation, are ready and willing to actively participate in the transformation of our digital health landscape.

In summary, we propose these recommendations:

1	*The establishment and operation of the national Digital Health Innovation Network (DHIN).*
2	*The development of a more effective supplier engagement framework.*
3	*The establishment and operation of a national Digital Health Academy (DHA) to transform the level of digital literacy in the health workforce.*
4	*Renewed focus on engaging and empowering consumers to address the issues of inequity of access and health outcomes.*
5	*Promotion of our digital health industry offshore.*

Acknowledgements

In authoring this report, I received great support from many people and organisations across all parts of the sector. In listing them below, I am aware that I will undoubtedly miss some through my own oversight. My apologies to them.

I would like to single out **Ryl Jensen** for the outstanding voluntary contribution she has made in respect to the writing, research and referencing of this report, without which it would not have been written.

Malcolm Pollock,
Second Opinion Limited

Scott Arrol, Former CEO, NZHIT.

Kate Reid, Chair NZHIT.

NZHIT Board.

Mark Cox, Acting CEO, NZHIT.

Amanda Reid, BERL.

Lloyd McCann, Mercy Ascot.

Gabe Rijpma, **Will Barnet, Tom Varghese,** Aceso.

James Rice, Nicole Gray, Ian McCrae, Belinda Allen, Orion Health.

Kevin Ross, PDH.

Jon Herries, Darren Douglas, Shayne Hunter, Ministry of Health.

Dr Robyn Whittaker, NIHI and Waitemata DHB.

Pat Kerr.

Graeme Muller, NZTech.

Angela Pantano, Roche.

Jim Swanson.

Erica Lloyd, Soul Machines.

Russell Craig, Microsoft.

Eric Hren, Michael Draheim, Alicia Carmichael, Cerner.

Scott Pearson, Noted.

Javad Ahmed, Valentia.

Colin McKenzie, Deborah Steele, Sysmex.

Kate Quirke, Steve Lutz, Alcidion.

John Carter, Clanwilliam.

Will Reedy, Spark.

Karen Mason, NZTE.

Bruce Davey, Matt Russel, Aranz Medical.

Harry Hawke, Webtools.

Marian Johnson, Ministry of Awesome.

Philip Jones, Whānau Tahi.

Virginian Mitchell, Jane Smallfield, Ben Barlow, AMS.

Andrew Clews, Andrew Paterson, Callaghan Innovation.

Tanya Houghton, Nicola Mitchell, Molemap.

Michael Hosking, Clinnovation

Robyn Henderson, Katie Sadetskaya, MBIE.

Ross Peat, Healthsoft/RxOne.

Stella Ward.

Byron Philips, Will Smart, Florian Stroehle, DXC.

Karen Blake, Matt Hector Taylor, healthAlliance.

Tony Wai, Procare.

Hector Kawai.

Anna Elders, Just a Thought.

Julie Nelson, James Gordon Wise Group.

Nick Kemp, Wild Bamboo.

Samuel Wong, Vensa.

Dr Ruth Large, Waikato DHB.

Kate Rhind, Healthpoint.

Dr Janine Bycroft, Health Navigator.

Erin Currie, MTANZ.

James Freed, Anna King, Sara Nelson, NHS England.

Stephen McKernan, Emily Mailes, EY.

Ativalu Lemuelu, MSD.

Tia Ashby, Tracey MacFarlane, The Moko Foundation.

Peter Jordan, HL7 NZ.

Geoff Simmons, Productivity Commission.

References

1 OECD Forum Network, *The importance of increasing access to high-quality health data* [website], https://www.oecd-forum.org/posts/the-importance-of-increasing-access-to-high-quality-health-data (accessed 14 January 2021).

2 Health and Disability System Review, *Health and Disability System Review – Final Report – Pūrongo Whakamutunga*, Wellington, Health and Disability System Review, p. 21.

3 The Treasury, The Wellbeing Budget 2019 [website], https://www.treasury.govt.nz/publications/wellbeing-budget/wellbeing-budget-2019 (accessed 04 December 2020).

4 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.5-7.

5 New Zealand Productivity Commission, *Technological change and the future of work*, Wellington, New Zealand Productivity Commission, 2020, p.IV.

6 Ministry of Health, *Standards in Development* [website], https://www.health.govt.nz/our-work/digital-health/digital-health-sector-architecture-standards-and-governance/health-information-standards-0/standards-development (accessed 15 December 2020).

7 New Zealand Digital Skills Forum, *Digital Skills Aotearoa: Digital skills for our digital future*, Wellington, 2020 p.10.

8 Ministry of Health, Health and Disability System Review, *Health and Disability System Review – Final Report*, p.5-7.

9 Ministry of Health, *Health applications assessment guidance* [website], https://www.health.govt.nz/our-work/digital-health/digital-health-sector-architecture-standards-and-governance/health-applications-assessment-guidance (accessed 15 December 2020).

10 Ministry of Health, *A Framework for Health Literacy* [website], https://www.health.govt.nz/publication/framework-health-literacy (accessed 15 December 2020).

11 Digital.govt.nz, *Digital Identity Trust Framework* [website], https://www.digital.govt.nz/digital-government/programmes-and-projects/digital-identity-transition-programme/about-the-digital-identity-transition-programme/digital-identity-trust-framework/ (accessed 31 January 2021).

12 Digital Identity NZ, *Helping New Zealand's transformation as a digital nation* [website], https://digitalidentity.nz/about/ (accessed 31 January 2021).

13 Digital.govt.nz, *Strategy for a Digital Public Service* [website], https://www.digital.govt.nz/digital-government/strategy/strategy-summary/strategy-for-a-digital-public-service (accessed 01 February 2021).

14 Ministry for Business, Innovation and Employment, *Digital Technologies Industry Transformation Plan. Progress Update for Industry*, 2020, p.1.

15 Health and Disability System Review, *Health and Disability System Review – Final Report*, p. 21.

16 The Treasury, *Living Standards Framework - Dashboard* [website], https://lsfdashboard.treasury.govt.nz/wellbeing/ (accessed 03 February 2021).

17 P. Arak, and A. Wojcik, *Transforming e-Health into a political and economic advantage*, Warsaw, Polityka Insight, 2017, p.4.

18 McKinsey Global Institute, *Prioritizing health: A prescription for prosperity*, p.ii.

19 McKinsey Global Institute, *Prioritizing health: A prescription for prosperity*, p.73.

20 Global Digital Health Partnership, [website], https://www.gdhp.org/ (accessed 12 February 2021).

21 OECD, *Health in the 21st Century: Putting Data to Work for Stronger Health Systems*, 2019, p.19.

22 OECD Data, 2021, *Hospital beds* (indicator) [website] https://data.oecd.org/healtheqt/hospital-beds.htm (accessed 05 February 2021).

23 OECD Data, 2021, *Doctors (indicator)* [website] https://data.oecd.org/healthres/doctors.htm (accessed 05 February 2021).

24 OECD Data, 2021, *Nurses (indicator)* [website] https://data.oecd.org/healthres/nurses.htm#indicator-chart (accessed 05 February 2021) (accessed 05 February 2021).

25 OECD Data, 2021, *Health spending (indicator)* [website] https://data.oecd.org/healthres/health-spending.htm#indicator-chart (accessed 05 February 2021).

26 H. Fraser, and P. Nolan, *Understanding health sector productivity*, New Zealand Productivity Commission, Te Kōmihana Whai Hua o Aotearoa, 2017, p.13.

27 Ministry of Business, Innovation and Employment, *How useful are our productivity measures? Literature review*, Wellington, Ministry of Business, Innovation and Employment, 2018, p.2.

28 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.18.

29 World Health Organisation, *Global strategy on digital health 2020 – 2025*, 2020, p.19. https://www.who.int/docs/default-source/documents/gs4dhdaa2a9f352b0445bafbc79ca799dce4d.pdf

30 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.178.

31 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.178.

32 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.178.

33 Ministry of Health, *The national asset management programme for district health boards: Report 1—The current-state assessment,* Wellington, Ministry of Health, 2020, p.10.

34 Deloitte, *Independent Review of New Zealand's Electronic Health Records Strategy*, Auckland, Deloitte, 2015, p.19.

35 OECD, *Health in the 21st Century: Putting Data to Work for Stronger Health Systems*, Paris, 2019, p.12.

36 Ministry of Health, *Technical Working Group Update*, Wellington, Ministry of Health, 2018, p.4.

37 Deloitte, *Independent Review of New Zealand's Electronic Health Records Strategy*, Auckland, Deloitte, 2015, p.18.

38 N.A. Ragaban, *eHealth Strategy Development and Implementation*, p.149.

39 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.223.

40 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.312.

41 Health Informatics New Zealand, *Industry View: NZ urgently needs digital health tech investment* [website], https://www.hinz.org.nz/news/506753/Industry-View-NZ-urgently-needs-digital-health-tech-investment.htm (accessed 04 December 2020).

42 Ministry of Health, *The national asset management programme for district health boards: Report 1—The current-state assessment*, Wellington, Ministry of Health, 2020, p.84.

43 Ministry of Health, *The national asset management programme for district health boards: Report 1—The current-state assessment*, Wellington, Ministry of Health, 2020, p.54.

44 OECD, *Health in the 21st Century: Putting Data to Work for Stronger Health Systems,* 2019, p.12.

45 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.207.

46 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.224.

47 OECD Data, *Gross Domestic Spending on R&D*, [website], https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm (accessed 13 February 2021).

48 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.274.

49 NZTech, *Annual Report 2020*, Wellington, NZTech, 2020, p.3.

50 OECD, *Empowering the health workforce: Strategies to make the most of the digital revolution*, Paris, OECD, 2020, p.7.

51 World Health Organisation (WHO), 2021, *Digital Health*, [website] https://www.who.int/health-topics/digital-health#tab=tab_1, (accessed 05 February 2021).

52 Ministry of Health, 2020, *National Health Index*, [website] https://www.health.govt.nz/our-work/health-identity/national-health-index (accessed 05 February 2021).

53 OECD, *Health at a Glance 2019*, OECD Indicators, OECD Publishing, 2019 p.157.

54 Ministry of Health, *HISO 10083:2020 Interoperability roadmap: Accelerating the shift to a fully interoperable digital health ecosystem*, Wellington, Ministry of Health, 2020, p.1.

55 OECD, *Empowering the health workforce: Strategies to make the most of the digital revolution*, Paris, OECD, 2020, p.7

56 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.223.

57 Asian Development Bank, *Transforming health systems through good digital health governance*, 2018, p.4.

58 European Union, *New European Interoperability Framework*, Publications Office of the European Union, 2017, p.25.

59 Gauld, R., *Public sector information system project failures: Lessons from a New Zealand hospital organisation.* Government Information Quarterly, 2007, p.102.

60 Hamilton, C., *The WHO-ITU National eHealth Strategy Toolkit as an effective approach to national strategy development and implementation*, Studies in Health Technology and Informatics, 2015, p.913.

61 Jin, B., and Morikawa, S., *Risk perception and innovative policy adoption: A case for e-Health in Estonia.* International Journal of Social Science and Humanity, 2017, p.664.

62 Kierkegaard, P., *Governance structures impact on eHealth*, Health Policy and Technology, 2015, p.39.

63 Asian Development Bank, *Transforming health systems through good digital health governance*, Manilla, Philippines, 2018, p.13.

64 Mergel, Prof. Dr. I. and others, *Agile: A new way of governing*, Public Administration Review, 2020, p.3.

65 New Zealand Productivity Commission, *Technological change and the future of work*, p.38-39.

66 New Zealand Productivity Commission, *Technological change and the future of work*, p.57.

67 Health Innovation Network, South London, [website], https://healthinnovationnetwork.com/ (accessed 12 February 2021).

68 Health Innovation Hub Ireland, [website], https://hih.ie/ (accessed 12 February 2021).

69 Centre for Healthcare Innovation, [website], https://www.chi.sg/ (accessed 12 February 2021).

70 Deloitte, *Health Tech Catalyst*, [website], https://www2.deloitte.com/uk/en/pages/life-sciences-and-healthcare/solutions/the-health-tech-catalyst.html (accessed 12 February 2021).

71 S. Howes and T.K. Bishop, *The hidden obstacles to government digital transformation*, London, Institute for Government, 2017, p.10.

72 New Zealand Legislation, *Public Finance (Wellbeing) Amendment Act 2020*, p.1.

73 National Health Service, *Digital literacy of the wider workforce* [website], https://www.hee.nhs.uk/our-work/digital-literacy (accessed 13 December 2020).

74 Ministry of Health, *HISO 10083:2020 Interoperability roadmap: Accelerating the shift to a fully interoperable digital health ecosystem*, Wellington, Ministry of Health, 2020, p.1.

75 Asian Development Bank, *Transforming health systems through good digital health governance*, Manilla, Philippines, 2018, p.3.

76 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.222.

77 OECD, *Empowering the health workforce: Strategies to make the most of the digital revolution*, Paris, OECD, 2020, p.7.

78 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.222.

79 OECD, *Empowering the health workforce: Strategies to make the most of the digital revolution*, Paris, OECD, 2020, p.7.

80 OECD, *Empowering the health workforce: Strategies to make the most of the digital revolution*, Paris, OECD, 2020, p.9.

81 OECD, *Health in the 21st Century: Putting Data to Work for Stronger Healt*h, 2019, p.11.

82 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.274.

83 AIA, AIA Vitality, [website], https://www.aia.co.nz/en/aia-vitality.html (accessed 12 February 2021).

84 F. Imlach and others, *Telehealth Consultations in General Practice During a Pandemic Lockdown: Survey and Interviews on Patient Experiences and Preference*, BMC Family Practice 21/1: p.21.

85 CNBC, *Demand for telemedicine has exploded in the UK as doctors adapt to the coronavirus crisis*, https://www.cnbc.com/2020/04/09/telemedecine-demand-explodes-in-uk-as-gps-adapt-to-coronavirus-crisis.html (accessed 12 February 2021).

86 Digital.govt.nz, *Digital Inclusion Action Plan 2020–2021* [website], https://www.digital.govt.nz/dmsdocument/174~digital-inclusion-action-plan-20202021/ (accessed 03 February 2021).

87 Ministry of Health, *'No credit, no worries' pilot initiative set to improve equity by enabling access to online health resources without using mobile data* [website], https://www.health.govt.nz/news-media/news-items/no-credit-no-worries-pilot-initiative-set-improve-equity-enabling-access-online-health-resources (accessed 03 February 2021).

88 Health and Disability System Review, *Health and Disability System Review – Final Report*, p.217.

89 Mental Health Foundation of New Zealand, *Apps, e-therapy and guided self-help*, [website], https://www.mentalhealth.org.nz/get-help/a-z/apps-e-therapy-and-guided-self-help/?gclid=Cj0KCQiAyJOBBhDCARIsAJG2h5cDQy9WGqZ2PUuqm5BBSFUg-B6ra3_vCnuJfcjguknN8g8kxWZKiE8aAifUEALw_wcB (accessed 12 February 2021).

90 Health Navigator, *National Health Content Hub 2020*, [website], https://www.healthnavigator.org.nz/healthy-living/n/national-health-content-hub/, (accessed 14 February 2021).

91 Statistics New Zealand, *New Zealand International Trade*, [website] https://statisticsnz.shinyapps.io/trade_dashboard/ (accessed on 12 February 2021)

92 OECD Development Centre, *Economic Outlook for Southeast Asia, China and India 2021: Reallocating Resources for Digitalisation*, Paris, 2021, p.143.

93 Upgraded, *Investor's Perspective: Finnish Digital Health Ecosystem – The Next Big Thing*, [website], https://www.upgraded.fi/finnish-digital-health-ecosystem-the-next-big-thing/ (accessed 12 February 2021).

94 Healthcare Information and Management Systems Society Inc, *Annual European eHealth Survey 2019*, Chicago, Healthcare Information and Management Systems Society Inc, 2020.

95 Connected Health, *Estonia is the perfect springboard for health-tech startups*, [website], https://connectedhealth.ee/estonia-perfect-springboard-health-tech-startups/ (accessed 12 February 2021).

96 Estonian Investment Agency, *Estonia exports digital transformation for industries* [website], https://investinestonia.com/estonia-exports-digital-transformation-for-industries/ (accessed 04 December 2020).

97 Ministry of Foreign Affairs of Denmark, *Denmark sets the agenda for digital healthcare*, [website], https://investindk.com/set-up-a-business/life-sciences/ehealth (accessed 12 February 2021).

Bibliography

AIA, *AIA Vitality*, [website], https://www.aia.co.nz/en/aia-vitality.html (accessed on 12 February 2021).

Asian Development Bank, *Transforming health systems through good digital health governance*, Manilla, Philippines, Asian Development Bank, 2018.

Centre for Healthcare Innovation, [website], https://www.chi.sg/ (accessed 12 February 2021).

CNBC, *Demand for telemedicine has exploded in the UK as doctors adapt to the coronavirus crisis*, https://www.cnbc.com/2020/04/09/telemedecine-demand-explodes-in-uk-as-gps-adapt-to-coronavirus-crisis.html.

Connected Health, *Estonia is the perfect springboard for health-tech startups*, [website], https://connectedhealth.ee/estonia-perfect-springboard-health-tech-startups/ (accessed 12 February 2021).

Deloitte, *Independent Review of New Zealand's Electronic Health Records Strategy*, Auckland, Deloitte, 2015.

Deloitte, *Health Tech Catalyst*, [website], https://www2.deloitte.com/uk/en/pages/life-sciences-and-healthcare/solutions/the-health-tech-catalyst.html (accessed on 12 February 2021).

Digital.govt.nz, *Digital Identity Trust Framework* [website], https://www.digital.govt.nz/digital-government/programmes-and-projects/digital-identity-transition-programme/about-the-digital-identity-transition-programme/digital-identity-trust-framework/ (accessed 31 January 2021).

Digital.govt.nz, *Digital Inclusion Action Plan 2020–2021* [website], https://www.digital.govt.nz/dmsdocument/174~digital-inclusion-action-plan-20202021/ (accessed 03 February 2021).

Digital.govt.nz, *Strategy for a Digital Public Service* [website], https://www.digital.govt.nz/digital-government/strategy/strategy-summary/strategy-for-a-digital-public-service (accessed 01 February 2021).

Digital Identity NZ, *Helping New Zealand's transformation as a digital nation* [website], https://digitalidentity.nz/about/ (accessed 31 January 2021).

Estonian Investment Agency, *Estonia exports digital transformation for industries* [website], https://investinestonia.com/estonia-exports-digital-transformation-for-industries/ (accessed 04 December 2020).

European Union, *New European Interoperability Framework*, Publications Office of the European Union, Luxemburg, 2017.

F. Imlach and others, *Telehealth Consultations in General Practice During a Pandemic Lockdown: Survey and Interviews on Patient Experiences and Preference*, BMC Family Practice 21/1, 2020.

Gauld, R., *Public sector information system project failures: Lessons from a New Zealand hospital organisation.* Government Information Quarterly, Elsevier Ltd, 2007.

Global Digital Health Partnership, [website], https://www.gdhp.org/ (accessed 12 February 2021).

Hamilton, C., *The WHO-ITU National eHealth Strategy Toolkit as an effective approach to national strategy development and implementation*, Studies in Health Technology and Informatics, 2015.

Health and Disability System Review, *Health and Disability System Review – Final Report – Pūrongo Whakamutunga,* Wellington, Health and Disability System Review, 2020.

Health Informatics New Zealand, *Industry View: NZ urgently needs digital health tech investment* [website], https://www.hinz.org.nz/news/506753/Industry-View-NZ-urgently-needs-digital-health-tech-investment.htm (accessed 04 December 2020).

Healthcare Information and Management Systems Society Inc, *Annual European eHealth Survey 2019*, Chicago, Healthcare Information and Management Systems Society Inc, 2020.

Health Innovation Network, South London, [website], https://healthinnovationnetwork.com/ (accessed 12 February 2021).

Health Innovation Hub Ireland, [website], https://hih.ie/ (accessed 12 February 2021).

Health Navigator New Zealand, [website], https://www.healthnavigator.org.nz/ (accessed 12 February 2021).

Health Navigator, *National Health Content Hub 2020*, [website], https://www.healthnavigator.org.nz/healthy-living/n/national-health-content-hub/, (accessed 14 February 2021).

H. Fraser, and P. Nolan, *Understanding health sector productivity*, Wellington, New Zealand Productivity Commission, 2017.

Jin, B., and Morikawa, S., *Risk perception and innovative policy adoption: A case for e-Health in Estonia*. International Journal of Social Science and Humanity, 2017.

Kierkegaard, P., *Governance structures impact on eHealth*, Health Policy and Technology, 2015.

McKinsey Global Institute, *Prioritizing health: A prescription for prosperity*, July 2020.

Mental Health Foundation of New Zealand, *Apps, e-therapy and guided self-help*, [website], https://www.mentalhealth.org.nz/get-help/a-z/apps-e-therapy-and-guided-self-help/?gclid=Cj0KCQiAyJOBBhDCARIsAJG2h5cDQy9WGqZ2PUuqm5BBSFUg-B6ra3_vCnuJfcjguknN8g8kxWZKiE8aAifUEALw_wcB (accessed 12th February 2021).

Mergel, Prof. Dr. I. and others, *Agile: A new way of governing*, Public Administration Review, 2020.

Ministry for Business, Innovation and Employment, *Digital Technologies Industry Transformation Plan.* Progress Update for Industry, 2020.

Ministry for Business, Innovation and Employment, *How useful are our productivity measures? Literature review*, Wellington, Ministry of Business, Innovation and Employment, 2018.

Ministry of Foreign Affairs of Denmark, *Denmark sets the agenda for digital healthcare*, [website], https://investindk.com/set-up-a-business/life-sciences/ehealth (accessed 12 February 2021).

Ministry of Health, *A Framework for Health Literacy* [website], https://www.health.govt.nz/publication/framework-health-literacy (accessed 15 December 2020).

Ministry of Health, *Health applications assessment guidance* [website], https://www.health.govt.nz/our-work/digital-health/digital-health-sector-architecture-standards-and-governance/health-applications-assessment-guidance (accessed 15 December 2020).

Ministry of Health, *HISO 10083:2020 Interoperability roadmap: Accelerating the shift to a fully interoperable digital health ecosystem*, Wellington, Ministry of Health, 2020.

Ministry of Health, *The national asset management programme for district health boards: Report 1—The current-state assessment*, Wellington, Ministry of Health, 2020.

Ministry of Health, *National Health Index*, [website] https://www.health.govt.nz/our-work/health-identity/national-health-index (accessed 05 February 2021).

Ministry of Health, *'No credit, no worries' pilot initiative set to improve equity by enabling access to online health resources without using mobile data* [website], https://www.health.govt.nz/news-media/news-items/no-credit-no-worries-pilot-initiative-set-improve-equity-enabling-access-online-health-resources (accessed 03 February 2021).

Ministry of Health, *Standards in development* [website], https://www.health.govt.nz/our-work/digital-health/digital-health-sector-architecture-standards-and-governance/health-information-standards-0/standards-development (accessed 04 December 2020).

Ministry of Health, *Technical Working Group Update*, Wellington, Ministry of Health, 2018.

N.A. Ragaban, *eHealth Strategy Development and Implementation: Interrelated Factors Impacting the Implementation of a National eHealth Strategy.* Auckland, University of Auckland, 2016.

National Health Service, *Digital literacy of the wider workforce* [website], https://www.hee.nhs.uk/our-work/digital-literacy (accessed 13 December 2020).

National Health Service Health Education England, 2021, *NHS Digital Academy*, [website] https://www.hee.nhs.uk/our-work/nhs-digital-academy (accessed 05 February 2021).

New Zealand Digital Skills Forum, *Digital skills for our digital future*, Wellington, 2020.

New Zealand Legislation, *Public Finance (Wellbeing) Amendment Act 2020*, Wellington, 2020.

New Zealand Productivity Commission, *Technological change and the future of work*, Wellington, New Zealand Productivity Commission, 2020.

NHS Health Education England, 2021, *NHS Digital Academy*, [website] https://www.hee.nhs.uk/our-work/nhs-digital-academy (accessed 05 February 2021).

Noor Van Riel MD and others, *The effect of Dr Google on doctor–patient encounters in primary care: a quantitative, observational, cross-sectional study,* BJGP Open, 2017.

NZTech, *Annual Report 2020*, Wellington, NZTech, 2020.

OECD Data, *Doctors* (indicator) [website]https://data.oecd.org/healthres/doctors.htm (accessed 05 February 2021).

OECD Data, *Gross Domestic Spending on R&D*, [website], https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm (accessed 13 February 2021).

OECD Data, *Hospital beds (indicator)* [website] https://data.oecd.org/healtheqt/hospital-beds.htm (accessed 05 February 2021).

OECD Data, *Nurses (indicator)* [website] https://data.oecd.org/healthres/nurses.htm#indicator-chart (accessed 05 February 2021).

OECD Data, *Health spending (indicator)* [website] https://data.oecd.org/healthres/health-spending.htm#indicator-chart (accessed 05 February 2021).

OECD Development Centre, *Economic Outlook for Southeast Asia, China and India 2021*: Reallocating Resources for Digitalisation, Paris, 2021.

OECD, *Digital Health,* [website], https://www.oecd.org/health/digital-health.htm (accessed 12 February 2021).

OECD, E*mpowering the health workforce: Strategies to make the most of the digital revolution*, Paris, OECD, 2020.

OECD, *Health in the 21st Century: Putting Data to Work for Stronger Health Systems*, Paris, 2019.

OECD Forum Network, *The importance of increasing access to high-quality health data* [website], https://www.oecd-forum.org/posts/the-importance-of-increasing-access-to-high-quality-health-data (accessed 14 January 2021).

OECD, *Health at a Glance 2019, OECD Indicators*, Paris, OECD Publishing, 2019.

P. Arak, and A. Wojcik, *Transforming e-Health into a political and economic advantage*, Warsaw, Polityka Insight, 2017 (https://ec.europa.eu/digital-single-market/en/news/transforming-ehealth-political-and-economic-advantage).

Robyn Whittaker and others, *Training clinicians to lead clinical IT projects*, New Zealand Medical Journal, Christchurch, 2020.

S. Howes & T.K. Bishop, *The hidden obstacles to government digital transformation*, London, Institute for Government, 2017.

Statistics New Zealand, *New Zealand International Trade*, [website] https://statisticsnz.shinyapps.io/trade_dashboard/ (accessed 12 February 2021).

The Treasury, *Living Standards Framework* - Dashboard [website], https://lsfdashboard.treasury.govt.nz/wellbeing/ (accessed 03 February 2021).

The Treasury, *The Wellbeing Budget 2019* [website], https://www.treasury.govt.nz/publications/wellbeing-budget/wellbeing-budget-2019 (accessed 04 December 2020).

Turcu C.E. and Turcu C.O., *Internet of Things as key enabler for sustainable healthcare delivery*, Elsevier Ltd, 2013.

Upgraded, *Investor's Perspective: Finnish Digital Health Ecosystem – The Next Big Thing*, [website], https://www.upgraded.fi/finnish-digital-health-ecosystem-the-next-big-thing/ (accessed 12 February 2021).

World Health Organisation, *Global strategy on digital health 2020 – 2025*, Geneva, 2020.

World Health Organisation, 2021, *Digital Health*, [website] https://www.who.int/health-topics/digital-health#tab=tab_1, (accessed 05 February 2021).

NZHIT, *Hauora, Mauri Ora: Enabling a Healthier Aoteroa, New Zealand, Auckland, New Zealand,* (2021).

Published in April 2021 by New Zealand Health Information Technology (NZHIT),
PO Box 303380, North Harbour, Auckland 0751. e. info@nzhit.nz | w. www.nzhit.nz

This document is available online at www.nzhit.nz

NZHiT
Enabling a Healthier New Zealand

e info@nzhit.nz
w www.nzhit.nz