

NEW ZEALAND
DATA FUTURES FORUM



NEW ZEALAND'S DATA FUTURE



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THE NZ DATA FUTURES FORUM

The Data Futures Forum is a group of people who collect and use data or think about how it is being used or will be used. We work in government, the private sector and academia. We do not reflect the whole of society. But we are citizens and have children and families who are growing up and live and work here in New Zealand.

The Minister of Finance and the Minister of Statistics invited us to establish the Forum because they want to know how we as a country should respond to the opportunities and the challenges presented by data.

We made an important decision right at the outset to not just put forward our own ideas. Rather, we want to create an opportunity for New Zealanders to engage in this conversation.

In June, we will reflect on what we have heard, and share our thoughts. We see this discussion as the next step towards our country's data future.



THE NZ DATA FUTURES FORUM



John Whitehead, Chair

CNZM. Former Secretary to Treasury.

Former Executive Director, World Bank



Stephen England-Hall

Chief Executive Officer, Loyalty New Zealand Limited



John Roberts

Director, Relationship Management, Department of Internal Affairs



James Mansell

Director of Innovation, Ministry of Social Development



Paul O'Connor

Founder, Director and Head of Research & Development, Datamine



Evelyn Wareham

General Manager Customer Insights Analytics and Research, Statistics New Zealand



Joshua Feast

Chief Executive Officer and co-founder, Cogito



Miriam Lips

Professor of e-Government, Victoria University School of Government



David Wales

Manager, Analytics and Insights, Performance Hub, Treasury



There is no Forum without you

The motivation behind this first report is to get people talking. We do not have all the answers, and we want to hear your views on what success would need to look like.

- What do you think about New Zealand's possible data futures?
- What kind of benefits and opportunities should we be aiming for?
- What risks and challenges need to be managed?

We know that one important element of our data future is how we choose to use, share, and protect personal and other information. Have we identified the right issues? Are we asking the right questions? Are there privacy-friendly ways of using and sharing data?

This first document sets out opportunities and challenges and introduces the central ideas, in what we hope is an easy-to-read fashion. Its purpose is to stimulate

conversation and debate, to help us to understand what New Zealanders think, and to begin to explore ways to respond to the new data environment.

Your feedback is important. We look forward to engaging with you between now and the end of May; online via our website or Linked In, and at events and conferences. More information on how to get involved is provided at the end of this document.

What do you think about our possible data futures?

What kind of benefits are we aiming for?

And what risks and challenges need to be managed?



INTRODUCTION

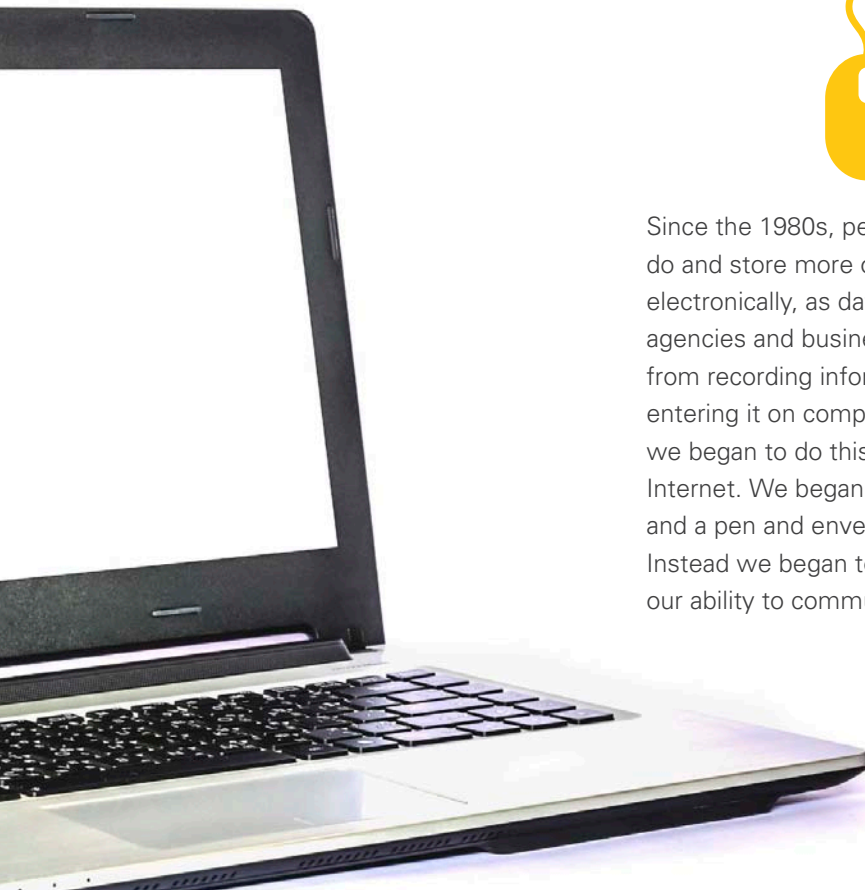




IT'S A CHANGING WORLD...

“For the first time in history, we can see enough about ourselves to build social systems that work better than the ones we have always had. Big data promises to lead to a transition on par with the invention of writing or the Internet.”

Alex Pentland www.scientificamerican.com/article/how-big-data-can-transform-society-for-the-better/

A partial view of a silver laptop with a black keyboard, positioned on the left side of the page.

Since the 1980s, people have begun to do and store more of our human activity electronically, as data. Government agencies and businesses have moved from recording information on paper to entering it on computers. In the 1990s, we began to do this for ourselves on the Internet. We began to stop using paper and a pen and envelope to send a letter. Instead we began to email. From there our ability to communicate has exploded.



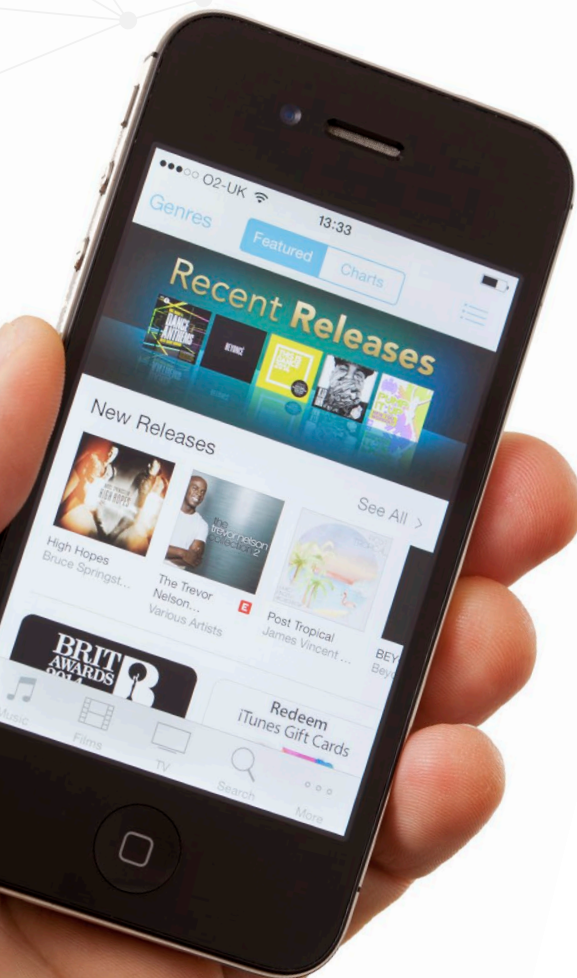
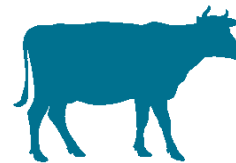
We're sharing photos, creating networks of friends and colleagues, and storing our personal and private information in the cloud. We no longer wait in a queue at the bank. Our financial transactions are done directly through the Internet. Supermarket checkout operators no longer key in a price, they scan a barcode. This not only tells us the price, but also what the product is. This information is stored alongside all your other purchases that day so the supermarket knows exactly what was in your shopping trolley.



Loyalty schemes mean that organisations can link your purchases to your personal identity and to the other transactions you make throughout the day at the chemist, with the bank, at the petrol station, and at the furniture store.

So, when you interact with business, or government, undertake digital activity yourself, or indeed, when you're going about your normal daily life, you are leaving digital breadcrumbs (data) behind.

IT'S A CHANGING WORLD...



These breadcrumbs are left when you swipe your card to get on the bus, and when you drive under a toll road and a photo is taken of your licence plate. When you view a webpage and you see all those Facebook and LinkedIn icons, information may be returned to these organisations to tell them what pages you are viewing. Your smartphone has a number of 'sensors': an accelerometer, gyroscope, and GPS. Some models measure temperature, humidity, air pressure, light intensity, and magnetic flux, others can sense your movement. Combined, this information can determine whether you're walking, catching a bus or in a car. A whole new range of exercise and fitness 'apps' are being developed, telling you how your walking and jogging has gone.

But this is not just about personal information. Cities are investing in electronic sensing too. They are tracking noise and pollution levels, the number of cars travelling over roads, and the level of waste water rushing through their pipes. Farmers are tracking local weather patterns, feed consumption, and fertiliser use to increase production.

Many people are suggesting that we're about to move to an 'Internet of Things' where data collected by sensors in your fridge, TV and heating systems will be used to create new kinds of products and services. Did you know that many new cars record activity such as the steering wheel's movement, car's speed, and direction of travel?



A REVOLUTION, NOT EVOLUTION

People are starting to create billboards that will detect your proximity, look up your social networking data and provide a relevant advert for you (and everybody else!) as you walk down the street. The billboards will use face recognition technology to know who is passing. The same technology is used at airports to identify security threats and is also used by companies who want to know who it is in all those photos you upload to the Internet. They can also use this to connect you to your friends by recognising both your faces in the one photo. Great if you are wanting to network with your friends. Perhaps not so great if you are having an affair or marching in protest, or if you have your travel stopped because you look like someone else.

www.theguardian.com/media/pda/2010/sep/27/advertising-billboards-facial-recognition-japan

The move to a data future that all New Zealanders are living through is more of a revolution than an evolution. It touches all aspects of personal lives, from engagement with society at large, business, government, and each other. This is not a technical problem. It is one about how we want to live, given that this new technology is already changing things and will continue to do so. How does New Zealand want to adapt to this future that is rushing towards us?

The Industrial Revolution must have seemed as overwhelming to people in the 1800s, when factories emerged, and automation, cars, telephones, railways all arrived on the scene. It was incredibly disruptive, causing pollution, transforming the way we worked, and where we lived. There were winners and losers as old style manufacturing, where a small family made shoes for the village, went out of business. Societies adapted. Some

early and well, others late and poorly. Sometimes we had to learn the hard way, as we did with asbestos, that some things shiny and new weren't so good. On the other side, who would go back to the days before electricity delivered light and heat and where the journey of a few miles might take a few days?

There is no reason to think the changes we are witnessing today will be any less disruptive. These changes are happening in years, not decades. Education is already changing. The music industry, newspapers, and publishing are all having to adapt. Whole new industries are being invented. People and business can collaborate and network globally in ways unimaginable 20 years ago. Will New Zealand adapt well and reap the rewards of early adoption and manage the real risks? Or will we follow along and hope that we somehow make it?

The stakes are large for our economy and the kinds of lives we live. We are a small country but we have the right to determine the kind of data future we want.





ADAPTING TO THE NEW DATA ENVIRONMENT



We are connected.
We are collecting,
sharing, and using
data about ourselves,
our communities and
activities, our work,
our devices, and our
environment.



We know more about our
world than we knew before
– we can track millions of
connections and exchanges
between people, we have
real-time information
about water, temperature,
transport, animal behaviour,
power use, and fuel
consumption.



We are learning how
to use the data – new
technologies, techniques,
and relationships are
developing, we're using
data for innovation, to
understand and manage
risk, and to make better-
informed decisions.



ADAPTING TO THE NEW DATA ENVIRONMENT

Big Data

Big data is 'big' because we are increasingly observing our world through inexpensive and automatic sensing systems, and because we are living so much of our lives on and through the Internet.

It is also big because of its potential to change the way we understand the world, and to underpin social change.

The big data revolution is about linking and sharing data to create new knowledge and support innovation. It's also about the related talent, technologies, and relationships that are needed to enable positive change.

A 'BIG BROTHER' FUTURE OR AN AGE OF POSSIBILITY?

There are huge opportunities for New Zealand to harness big data and to develop the talent and technologies that will lead to tomorrow's economic, social and environmental benefits.

We are also concerned about privacy and the potential for misuse of information. There are important challenges and risks in sharing and using data – inappropriate access, the misuse of information,

and personal choice. When things do go wrong, the effects can be merely annoying, or have significant impact on individuals.

How we adapt to change will in part determine our future economic and social prosperity.

How we adapt matters.



KIWIS ARE PIONEERS – WE CAN FIND A WAY FORWARD

WHERE ARE WE NOW?



Trusted environment

Privacy friendly


Effective data use

Technologies and talent

New Zealanders are already taking advantage of the new data environment. Some great examples of innovation are profiled in this document. Compared with other countries, New Zealanders have relatively high trust in their central government agencies around personal information protection. We are well-positioned to take advantage of the new data environment because we are a small well-connected nation, with few layers of government and with good quality privacy legislation.

New Zealanders are concerned about privacy and the potential for misuse of data. The ways that we currently manage personal information in both the private and public sectors are eroding

trust and raising concerns. Researchers are still developing ways to understand and use big data effectively, and we know we need to develop skills and technologies to make best use of the data. We also know that the world is changing and we need to adapt. New technologies, changing attitudes, and other countries' data-sharing and privacy practices are affecting us here in New Zealand.



The Data Futures Forum members think the status quo is a poor solution. It neither manages risk nor enables the improvements to individual lives made possible through effective use of data. The nation that fails to safely and responsibly improve access to shared data will be left behind. We want to explore the possibilities and create a data future that enables us to realise the benefits of effective data use, and minimise the risks and challenges.

BENEFITS AND OPPORTUNITIES OF THE NEW DATA ENVIRONMENT





THE POWER OF BIG DATA

“With Big Data we can now begin to actually look at the details of social interaction and how those play out, and are no longer limited to averages like market indices or election results. This is an astounding change. The ability to see the details of the market, of political revolutions, and to be able to predict and control them is definitely a case of Promethean fire — it could be used for good or for ill, and so Big Data brings us to interesting times. We’re going to end up reinventing what it means to have a human society.”

Alex ‘Sandy’ Pentland is a pioneer in big data, computational social science, and technology for developing countries. He was named by Forbes magazine as one of the world’s seven most influential data scientists.

“I believe that the power of Big Data is that it is information about people’s behavior instead of information about their beliefs. It’s about the behavior of customers, employees, and prospects for your new business. It’s not about the things you post on Facebook, and it’s not about your searches on Google, which is what most people think about, and it’s not data from internal company processes and RFIDs. This sort of Big Data comes from things like location data off of your cell phone or credit card, it’s the little data breadcrumbs that you

leave behind you as you move around in the world.

What those breadcrumbs tell is the story of your life. It tells what you’ve chosen to do. That’s very different than what you put on Facebook. What you put on Facebook is what you would like to tell people, edited according to the standards of the day. Who you actually are is determined by where you spend time, and which things you buy. Big data is increasingly about real behavior, and by analyzing this sort of data, scientists

can tell an enormous amount about you. They can tell whether you are the sort of person who will pay back loans. They can tell you if you’re likely to get diabetes.

They can do this because the sort of person you are is largely determined by your social context, so if I can see some of your behaviors, I can infer the rest, just by comparing you to the people in your crowd. You can tell all sorts of things about a person, even though it’s not explicitly in the data, because people are so enmeshed in the surrounding



THE POWER OF BIG DATA



"The promise is for financial systems that don't melt down, governments that don't get mired in inaction, health systems that actually work, and so on, and so forth."

social fabric that it determines the sorts of things that they think are normal, and what behaviors they will learn from each other.

As a consequence analysis of Big Data is increasingly about finding connections, connections with the people around you, and connections between people's behavior and outcomes. You can see this in all sorts of places. For instance, one type of Big Data and connection analysis concerns financial data. Not just the flash crash or the Great Recession, but also all the other sorts of bubbles that occur. These are systems of people, communications, and decisions that go badly awry. Big Data shows us the connections that cause these events. Big data gives us the possibility of understanding how these systems of people and machines work, and whether they're stable.

The notion that it is connections between people that is really important is key, because researchers have mostly been trying to understand things like financial bubbles using what is called Complexity Science or Web Science. But these older ways of thinking about Big Data leaves the humans out of the equation. What actually matters is how the people are connected together by the machines and how, as a whole, they create a financial market, a government, a company, and other social structures.

All sorts of specialties are coming to understand that it is the connections between people that is actually the core problem in making transportation systems work well, in making energy grids work efficiently, and in making financial systems stable. Markets are not just about rules or algorithms; they're about people and algorithms together.

Understanding these human-machine systems is what's going to make our future social systems stable and safe. We are getting beyond complexity, data science and web science, because we are including people as a key part of these systems. That's the promise of Big Data, to really understand the systems that make our technological society. As you begin to understand them, then you can build systems that are better. The promise is for financial systems that don't melt down, governments that don't get mired in inaction, health systems that actually work, and so on, and so forth."

www.edge.org/conversation/reinventing-society-in-the-wake-of-big-data



BENEFITS AND OPPORTUNITIES

The new data environment gives a richer and deeper understanding of the world.






GIVING NZ A COMPETITIVE ADVANTAGE



1

A WORLD-LEADING DATA ENVIRONMENT WILL SUPPORT INNOVATION, EMPLOYMENT AND ECONOMIC GROWTH

- 
- Investing in the knowledge sector and growing New Zealand's capacity to use data will position New Zealand to be a leader in this sector, attract international investment, and increase our export earnings.
 - New Zealand will benefit from an environment where researchers can access quality data, to enable more research and create a wealth of new knowledge. Where universities have access to world class data, they will attract top researchers and increase the benefit.
 - Better access to data will help us understand our economy and the forces that shape it, and help us build the networks that support innovation in New Zealand.
 - When data-driven innovation is happening, New Zealanders will be able to use innovative products, better health care, and more efficient transport.



DATA-DRIVEN POLICY AND GROWTH

New Zealand researchers use patent data to understand the drivers of innovation and economic growth, informing policy development.



*... innovation is the
key driver of prosperity
in advanced economies.*

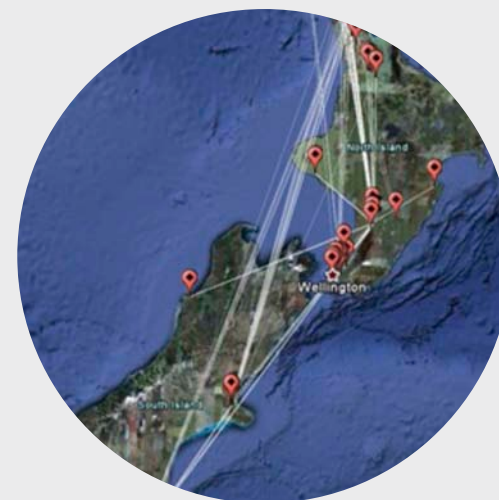
BY PROF SHAUN HENDY FRSNZ

"Together with a number of colleagues, I have been investigating innovation, using open data and new tools from theoretical physics and mathematics. Most economists would agree that innovation is the key driver of prosperity in advanced economies over the long run. As New Zealand is a relatively small economy that is exceptionally distant from its trading partners, we have been studying the role that scale and connectivity play in innovation. This work is now used by the Ministry of Business, Innovation and Employment to benchmark regional innovation in New Zealand.

Using open data on patents, we can examine the "economic geography" of innovation in countries, regions and cities.

Patents are a venerable source of open data: in return for the grant of a fixed-term monopoly, inventors can disclose the details of their invention so that others can build on it. Large patent data sets can now be geocoded and name harmonised, providing rich, detailed information about the invention process itself. In the future we hope to combine this with other data from government so that we can better track the value of innovation.

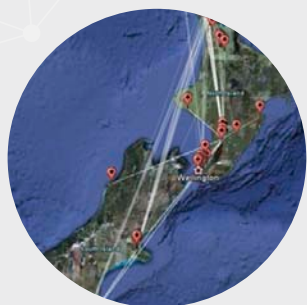
For example, if we look at the number of patents per capita in Auckland and Adelaide, two cities with similar populations, we find that the number of patents per capita turns out to be similar, while much larger cities like Melbourne and Sydney produce many more patents per capita.



New Zealand's largest inventor network on Google Earth. Inventors in New Zealand that have filed patents in the European Patent Office have been geolocated and are linked if they share a patent.



DATA-DRIVEN POLICY AND GROWTH



For more information about this research, see sciblogs.co.nz/a-measure-of-science/2011/04/14/the-new-zealand-innovation-ecosystem-map/

Prof Hendy and Sir Paul Callaghan have discussed innovation in NZ in their 2013 book “Get off the Grass” www.amazon.com/Get-off-Grass-Kickstarting-Innovation/dp/1869407628

In fact, Australia produces about 30% more patents per capita than New Zealand, almost entirely because of the high output of Melbourne and Sydney. This seems to be quite general – bigger cities produce more patents per capita and bigger population centres drive innovation.

This is an important finding for New Zealand, which doesn’t have a truly large city by international standards; we need to learn to collaborate as if we were a city of four million people. Indeed, there are a number of small countries, such as Denmark, Finland, and Israel, which have overcome the disadvantages of size to build successful high-technology industries with scale in areas unrelated to previous strengths.

When we look at who is connected to whom in New Zealand’s largest network of inventors and at our international connections, we find that the largest group of people who have collaborated

in this country is a network of about 450 inventors. These inventors work for 14 different New Zealand companies, four CRIs, three universities and a private research institute. The connections are often quite surprising. For example, these links don’t always seem to be sector-based.

A nice example of this is Weta Digital in Wellington. We are proud of having one of the top computer graphics companies in the world and Weta Digital’s contribution to movies such as “The Rise of the Planet of the Apes” and “The Hobbit”. But what does Weta Digital want from the New Zealand science system? You might expect it wants access to ICT researchers or parallel computing. Actually, what you find is that it is working with researchers at the Auckland Bioengineering Institute, because to make a convincing animation of an ape or person, Weta need to have an engineering model of how people and apes move.

If we had sat down 20 years ago and said we want a film industry in New Zealand, it would not have occurred to us to put public funding into Auckland’s Bioengineering Institute. But today, it is one of the key players in New Zealand’s innovation ecosystem that will help Weta Digital stay ahead of the game.

If New Zealand is to become as prosperous as other advanced nations we need a rich and diverse innovation ecosystem that will enable us to fill in these gaps. Because of the variety and unpredictable nature of the science we will need in the future, we must strike a balance between the generating new knowledge across the board and picking winners based on past success.”



BUSINESS OPPORTUNITIES



2

NEW MARKETS

- The new data environment provides businesses with opportunities to create and sell new products and services, including new personalised services.
- The knowledge sector will grow, as there is increasing demand for the skills and technologies needed to make use of data.
- Access to data will support innovation.
- Using government data, businesses will be able make informed bids for government business.

INNOVATION

- Businesses are already using data to understand their business processes and their customers – to increase their return on investment. The result is cost savings and increased profits.
For example:
- Real-time data on milk volumes in farm milk tanks helps Fonterra to optimise milk transport. Dairy farmers use data-driven precision agriculture to get the most out of fertiliser and water application, and increase production.
- Data-driven insights help New World target its customers. New World is one of New Zealand's largest supermarket chains, with 137 stores throughout the

country. The annual New World Wine Awards direct marketing campaign takes a large national event (13 international wine judges, over 1,000 wines entered, 50 gold medal winners) and breaks it down to a single customer level, creating highly relevant and tailored marketing for each recipient – including a wine recommendation for each customer matching the customer's preferred wine varietal, based on their purchase history. The ultimate goal is of course to drive wine sales at New World; in 2012 the supermarkets achieved a 30% increase



DATA-DRIVEN BUSINESS EFFICIENCY

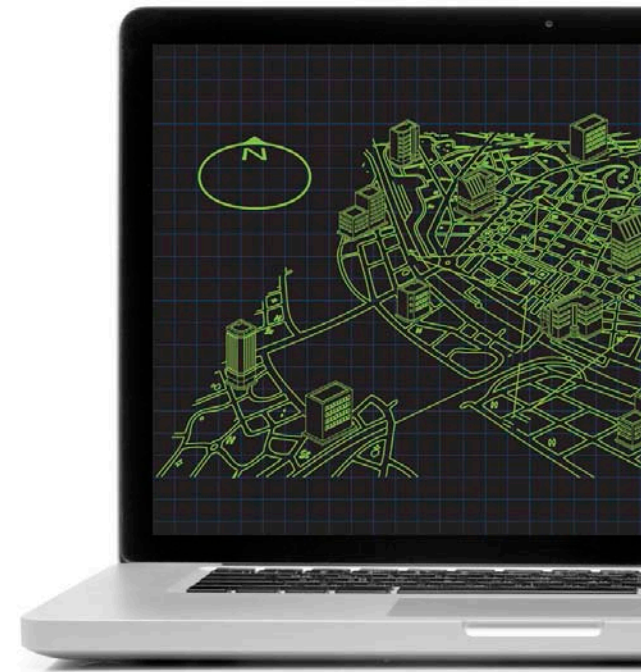
Private sector innovation

One of us (who works in government) got approached by a private hospital with a request for de-identified health data. This private health provider thought they could do a better job of investing in rehabilitation services than the local District Health Board. The trouble is that they needed to analyse the data to see if this business model would work. Unfortunately private companies are not allowed access to even anonymous data at the moment. If they could have, they may well have developed a more effective policy than the DHB around rehabilitation and been able to promote this idea. Who knows? Even the act of this being done might put pressure on state sector agencies to perform better.

Critchlow, a New Zealand geospatial services consultancy, supports organisations to realise economic benefits from spatial analysis – optimising sales and distribution networks; smart routing fleets to save time and money; identifying fraudulent activities; and improving overall organisational performance and competitiveness.

CRITCHLOW'S WORK INCLUDES:

- Work with the Auckland Council to enable the analysis, assessment, monitoring and reporting of the Auckland region's capacity for growth. The project involved developing a model to identify the residual vacant capacity for each and every land unit across Auckland, using an algorithmic approach. It not only provided a more thorough understanding of development potential, but contributed to better evidence-based planning, and economic innovations through resource savings and timeliness.
- Creating efficiencies and improving customer retention for Green Fingers, a garden-waste recycling firm in the upper North Island. Critchlow created a mapping system that better allocated new customers to existing truck collection routes. In doing so, they eliminated two hours of manual labour per day per truck; there was a 75 percent reduction in customer complaints; and a 15 percent increase in collection productivity. Through the smart use of geospatial data, economic and environmental benefits were realised.





BETTER PUBLIC SERVICES



3

Data-driven policy helps international students

Data-driven research informed labour market policy, benefitting individuals and employers. Ministry of Business, Innovation and Employment research asked whether the employment of temporary migrants had negative effects on the New Zealanders' employment opportunities. The findings showed that temporary migrants actually add to the labour market by filling gaps in skills shortages and encouraging growth in particular industries. As a result, international students are now allowed to work more hours while studying in New Zealand.

MORE EFFECTIVE, TARGETED POLICY AND SERVICES

- When government services are better researched, planned and targeted then outcomes improve for people, society, and the economy.

For example:

- Using geospatial, population, traffic, and travel to work information, it's possible to locate the best place for a new hospital, school, or community facility, to serve communities most at need, or cut travel times. The Ministry of Education already uses population projections, building consents data, and school enrolment data to work out where new schools are needed.

VALUE FOR MONEY

- Shared state-sector data can enable the public sector to achieve better outcomes for less.
- Deeper understanding, based on data analysis, helps us understand what works and what doesn't, informing bolder and more preventative policy. What are the real costs and effects of different programmes: inaction vs early prevention or ongoing management? For example, the Ministry of Social Development is using shared data to better learn which of its services get better outcomes for individuals and communities. The results mean we waste less public expenditure on services that don't work and invest more on what does.

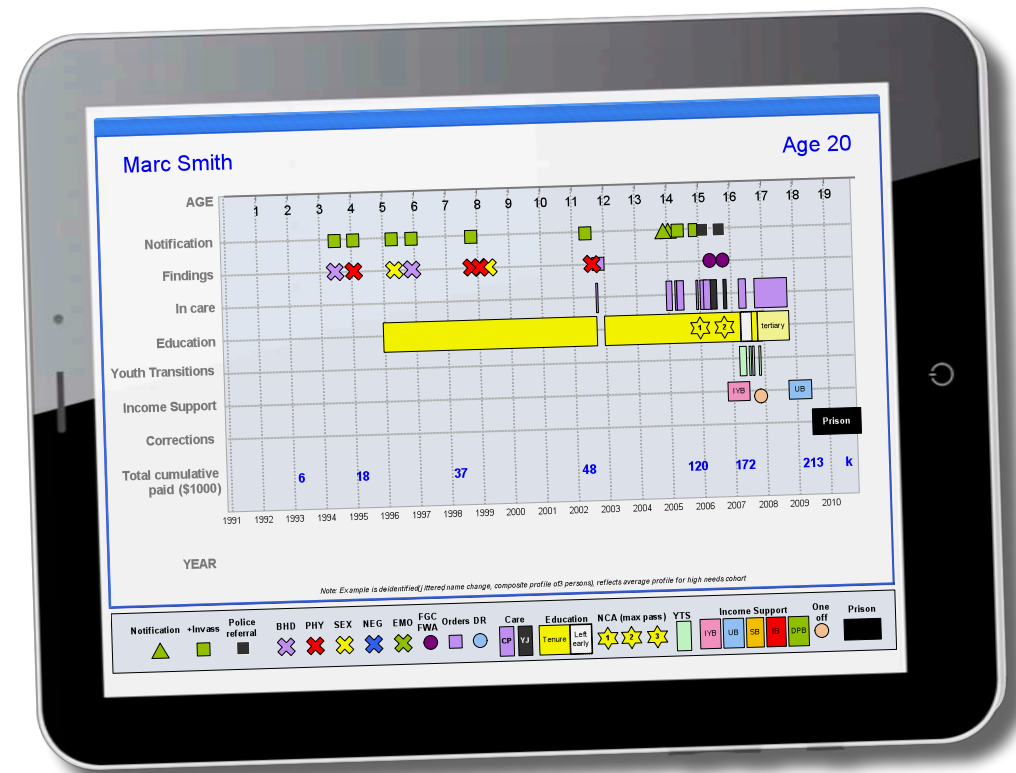
- Sharing data supports efficiency by reusing information. For example, the NZ Transport Agency links deaths data with data about drivers licences so they can identify deceased licence holders; New Zealand hospitals use citizenship information to check whether a patient is eligible for free health care.

PUBLIC SERVICES: MARC SMITH

The Marc Smith case illustrates the opportunity.

Marc Smith (not a real person) is an example drawn from shared data from Education, Child Protection, Youth Justice, Youth Transition Services, Work and Income, and Corrections to better understand outcomes.

Marc progressed from behavioural difficulties at age three and a half, through to substantiated cases of physical and sexual abuse at age 11, on to youth offending as a teenager, and was taken into state care from 14 years. He had multiple placements with foster carers and spent time in a youth justice residence. He didn't do too badly in education, getting one subject at NCEA level 2. However, as a young adult he went from tertiary study onto a benefit and had spent time in prison by age 20.





PUBLIC SERVICES: MARC SMITH



*Shared state-sector
data provides a
crucial tool*

The state sector has spent well over \$200,000 on Marc, yet his outcome is poor. The outcomes for the community, for his victims, and for the tax payer are also poor.

The profile Marc illustrates is not uncommon. Thousands of New Zealanders have a similar profile or are even more socially costly to themselves and their communities. Fiscally, a small number of people cost the country billions. This does not have to happen. Rather than waiting to trickle-spend hundreds of thousands of dollars over a person's life time, and waiting until too late to rehabilitate, shared data allows us to identify high-risk pathways early and provide the knowledge and confidence required to make government service

providers accountable earlier. This may enable us to spend a little more up front, where it makes a bigger difference – and then track the results and become accountable for outcomes.

Shared state-sector data provides a crucial tool to make these pathways visible, and to learn how to invest more effectively to make a difference. All New Zealand benefits when the state sector can see the whole person.





BETTER PLACES TO LIVE, WORK, & PLAY



4

PLACES AND SPACES WILL BE SAFER AND HEALTHIER

- Cities and urban planning will improve from data-driven decision-making, innovation, and risk management.

For example:

- Ambulances could get more green lights as they rush to an accident
- Public transport routes and roading could be developed to fit real work travel patterns
- Pot holes can be identified and fixed more quickly.

MAKE BETTER USE OF NATURAL RESOURCES

- By sharing data between government and business, we can drive efficiencies and reduce waste.

For example:

- Businesses and utilities can innovate to utilise smart meters and linked smart appliances, to understand and make power consumption smarter (e.g. your heater can predict when to turn on/off; your phone's GPS tells your house to prepare for your arrival).

REDUCE IMPACT ON THE NATURAL ENVIRONMENT

- Building on the rich world of data, we can find better ways to interact with our environment, to preserve our unique natural heritage
- Conservation scientists use temperature and survey data on seed production to predict mast years, when forest plants produce large seed crops. Mast years result in a large increase in rodents and other animals that eat native birds and insects. Now scientists can target pest control activities to get the most impact, saving money and protecting native birds.





CHRISTCHURCH AS A SENSING CITY



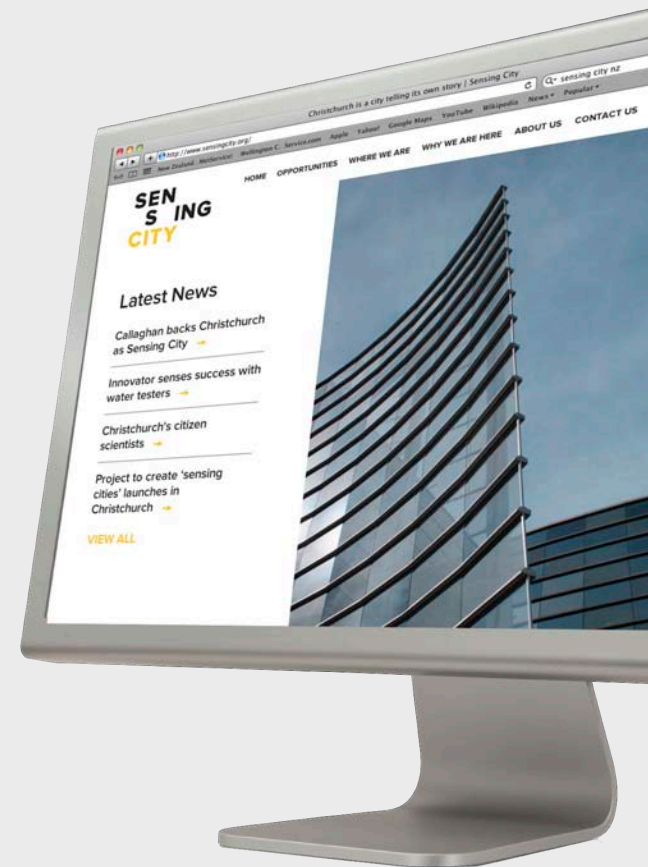
... there's a need to understand how to make cities more efficient, more liveable, more sustainable and use fewer scarce natural resources.

"There is a challenge facing the world, but it's not one that many people recognise. Today more people live in cities than in any other environment on the planet, and this is not a trend that's likely to reverse. At the same time however there's a need to understand how to make cities more efficient, more liveable, more sustainable and use fewer scarce natural resources.

One of the key approaches to tackling this is through the use of data to peel back some of the layers of complexity that surround this puzzle. However, despite a lot of expensive marketing by technology companies, there's actually not a single smart city in the world that has the volume or coverage of data that is required. That's because it's fiendishly difficult to retrofit smart city technology into existing cities. In contrast, if you're building a city from scratch, it becomes a lot easier to do this.

Sensing City is an initiative in Christchurch to incorporate a layer of sensors, data and analytics into the rebuild of the city. The premise is to use sensors to measure as many variables as possible such as traffic flow, footfall, cellphone traffic, noise, luminosity, temperature, energy use, and water consumption. It will also bring together datasets about the city from a range of sources that are currently held separately.

The aim is to leverage the NZ\$40 billion that will be spent on rebuilding the city to uncover greater efficiencies in the urban environment, enable citizens to participate in discussions on what's important to them, and create a new industry for New Zealand that positions Christchurch as a globally recognised hub. There's nowhere else in the world where the heart of a living city is being rebuilt from scratch, and this is the opportunity that Sensing City is seizing.





CHRISTCHURCH AS A SENSING CITY

SENSING CITY

Information: www.sensingcity.org

Updates: [www.fb.com/TheSensingCity](https://www.facebook.com/TheSensingCity)

Sensing City in four minutes:
vimeo.com/75365337

The initiative has three broad aims:

- Attract smart talent to New Zealand
- Create unique, high value, exportable intellectual property (linked to sensor development, and data analytics)
- Attract international inward investment from technology companies that are seeking a living lab environment.

To achieve these aims, all data from Sensing City will be as open as possible in order to create an innovation ecosystem for technology companies. There will be licensing fees associated with high volumes of data usage, but for small startups, and the public, access will be very cheap. An open-data framework also provides the transparency that is necessary to allay concerns about privacy.

The initiative has attracted global attention, with media coverage in the Financial Times, Scientific American and numerous mentions in construction and building magazines. Sensing City has also captured the interest of technology giants, with a range of companies actively discussing how they can participate in the project.

It's not just companies and regulatory authorities that will participate in Sensing City, as the aim is also to include the people that use the city. Technology has advanced to the point that school children can build their own sensors and publish the data online, and Sensing City will embrace this emerging trend as citizens start to measure what's important to them.

At the highest level the aim of Sensing City is simple: if the country is going to spend \$40 billion in one location in a relatively short space of time, how can this be spent in such a way that it ensures that our grandchildren are more likely to stay in the country? The development of Christchurch as a world leader in an emerging, hot new industry that leverages sensors, big data and advanced analytics is one of the few options open to New Zealand."

ROGER DENNIS, 2014



TRANSFORMING EVERYDAY LIFE



5

If you were willing to share bank data with your supermarket data and your bills payment information then businesses could provide automated budgeting and savings services. This could help you work out where to save, or to forecast your eventual retirement savings in real time. These kind of tools, resources, and advice were once only available to people with a lot of money - who hired the best accountants and business advisors.

AUTOMATION OF MUNDANE TRANSACTIONS

- One advantage of data sharing is better coordination of activity in your daily life, saving time and effort.
- Imagine if your health records automatically go to your new doctor, your child's education records to their new school, or if your fridge tells your online supermarket you need more milk.

PERSONALISED PRODUCTS AND SERVICES

- In the new data environment, it will be easy to access the products and services you want and need.
- Companies develop more and more new services. You can already access route suggestions and traffic information on your smartphone or sign up to a service that delivers local weather information based on the data collected by smartphone sensors.
- Doctors and medical professionals could use your data to identify health risks and provide pre-emptive or personalised care - it's already possible to predict where the next flu outbreak is likely to be.

EVIDENCE TO INFORM PERSONAL DECISIONS

- Information can help individuals make informed decisions.
For example:
- Students deciding what to study can now access information on the different income and employment rates for different qualifications. Careers NZ and the Ministry of Education have developed tools based on research using linked education and employment data.

www.careers.govt.nz/tools/compare-study-options/

www.dol.govt.nz/publications/lmr/occupational-outlook/index.asp



TRANSFORMING EVERYDAY LIFE

MAKING THE BIG DECISIONS IS EASIER

SLEEP STATES

Medical researchers in England 'crowd source' information about dreams via smart phones.

An application senses when you're dreaming by your movement and wakes you to write down your dream. This information is collated from people over the world to help researchers understand sleep and dreaming. If you have a sleep disorder, information about your sleep could help doctors determine your best treatment.

Wednesday afternoon and you're standing at a real-estate auction when your smartphone beeps to life. A locally configured i-beacon has activated an app on your phone that presents all the information relating to the property you are standing in, and asks if you intend to bid. You click yes and your app preloads with maximum price and mortgage thresholds, based on your financial health and personal circumstances. You're ready to go. The auction ensues and you win. At the press of a biometric button you consent to your private data and the auction data being shared for a few minutes with all mortgage providers you have invited to tender for your business. The tenders are back and your smartphone makes a recommendation, which you override in favour of your preferred brand. Seconds later, payments are made, contracts are exchanged, and you now own a new home. Not a single piece of paper changed hands.

All the data necessary to complete the transaction has been shared with your consent. All mortgage providers who were unsuccessful have their data access revoked. But it doesn't stop there... Your insurances, broadband, home phone, electricity, gas, waste collection, council taxes, registered addresses for tax, cars, school, and Internet shopping deliveries are all automatically scheduled for updating for when you move in. No effort required. And if better options are available, these are presented to you too. Even your smartphone mapping and calendar services are automatically primed for the move - best route to work, public transport options, and travel times are all optimised and updated for your convenience.

What's amazing about this is that all the data necessary to enable the above scenario to occur already exists, but today it's locked away, largely inaccessible in vaults that are owned by

different companies, organisations, and government departments. In a future where you control your data and consent to access to it for services you want, those silos and vaults begin to disappear. Imagine the possibilities.







OPEN TRANSPARENT GOVERNMENT



6

DEMOCRACY IN ACTION

- 
- 
- Making data available means more informed debate and greater trust in our institutions. It enables shared and informed governance and policy development. Citizens, including marginalised groups, have a greater say, and can hold government to account not just for the services they deliver but for their effectiveness and impact. This is not just about government: making data available also supports transparency in other governance settings, such as iwi or non-government organisations.
 - The chief executives' data is some of the most often viewed data released by government. Making public sector chief executives spending data freely available has allowed people to take a look and see how public money is spent, supporting integrity and good conduct.
 - Government agencies are already working towards making more high-value public data available for reuse under the Declaration for Open and Transparent Government. The Charities Register, topographic information, and traffic volume data are examples of government data that is being used by people, businesses, and other government agencies for economic, social, and democratic benefits.
www.ict.govt.nz/programmes/open-and-transparent-government/open-data-case-studies/



OPEN TRANSPARENT GOVERNMENT

THE FLOW-ON EFFECT – RICHER DATA SUPPORTS POLICY AND GOVERNANCE

www.cwms.org.nz

ecan.govt.nz/advice/your-water/water-metering/Pages/case-studies.aspx

Many Canterbury farmers are automating reporting of their water use, creating richer data that supports collaborative and informed water management.

Meters are required under the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010. Metering is designed to help manage water holdings for the long term, and to assess compliance with individual resource consents that permit the taking of large amounts of water.

Under the Canterbury Water Management Strategy (CWMS), water is collaboratively managed with the tangata whenua. Environment Canterbury, Ngāi Tahu, local councils, community representatives, and other stakeholders work together to balance economic and environmental goals.

The goals of the CWMS include supporting more efficient water use and involving people in decision-making. Having richer data supports these goals.

Using the data automatically collected at the meters, all partners are able to assess how much water is being used by consent holders, and the longer-term effects on rivers and ground water, and they can collaboratively establish benchmarks for good water use. The data will inform future policy decisions, so water can be used more efficiently and where it is most needed, whether that is by other farmers or back into waterways that are stressed.

This collaboration is consistent with the approach taken at the Land and Water Forum, where diverse groups contributed to policy formation. The Forum concluded that good open data is extremely

important to the water debate, as it supports councils, scientists, and other stakeholders to engage and comment on policy and practice.

The data provided by the meters is also being used by Canterbury farmers to inform sustainable and efficient production. Some farmers are combining the data from their water meter with data that comes from their irrigation system, and using the information to determine the most efficient and effective speed and spread of water. The rate of water application for each product and crop can be set from the office, and irrigators set to turn off automatically to avoid irrigating unproductive land or land already at capacity, reducing wastage.



CHALLENGES, RISKS, AND TENSIONS



CHALLENGES, RISKS, AND TENSIONS

In the new data environment we are concerned about access to and control of data and the potential for misuse.

ACCESS

People are accessing more and more data

Access is often for legitimate purposes and real benefits, but is sometimes accidental or wrongful.

CONTROL

People are concerned about losing control of data about themselves

There are competing and overlapping interests in data. Control and consent are not always simple, possible, or desirable.

POTENTIAL

MISUSE

Sometimes people misuse data to serve different interests

The impacts can be merely annoying or serious. Individuals, communities, businesses, and governments can all be affected by misuse.

MISUSE CAN INCLUDE

1

Invasive use

2

Discrimination

3

Exclusion

4

Malicious use

5

'Big Brother'



CHALLENGES, RISKS, AND TENSIONS

PUSHING THE BOUNDARIES OF PRIVACY AS A BUSINESS MODEL



*... things can and do
go wrong with sharing
and using data.*

A lot of people, when they think about the use of data, think about the US National Security Agency, Edward Snowden, and embarrassing privacy blunders in the public and private sector. Together these events illustrate how things can and do go wrong with sharing and using data. A lot of the risks in this area have exposed through the media. Over recent months, we've seen a steady stream of stories about the privacy challenges of sharing and using data.

In New Zealand, we've seen a series of embarrassing breaches of people's personal data, caused either by malicious hackers cracking into data (Yahoo Xtra, LinkedIn), by people wanting to highlight weaknesses so that can be addressed (WINZ kiosks), or by people mistakenly sending information to the wrong address (ACC, EQC). In a paper-based environment, these might have revealed one or a few names. In the world of digital linked data, they can easily expose tens or hundreds of thousands of people's personal information.

If people are data and privacy savvy, they can make the system work for them. But what's private depends on each person's individual situation. Something that seems completely innocuous to one person can be a big deal and deeply harmful to another. When mistakes are made, and personal information is released to the world, the vulnerable suffer most.





CHALLENGES, RISKS, AND TENSIONS

SCENARIO

MY INFORMATION MATTERS TO ME

Sure I have a number of secrets that I would rather were not shared with the whole world, I guess maybe everyone does. For me, it's not been an easy life so far. It's taken me a long time to manage the demons of my past and present, but I've got on track with the right help. I was getting by ok – until someone managed to find out. When my personal information was broadcast by mistake on a government website, all of a sudden the media picked up the story, and everyone knew about my dirty laundry. I am so ashamed that I haven't been to my classes or to work for the last few weeks. I don't know how I can show my face again. I've had to resort to going back on a benefit, and I'm thinking that perhaps I'll have to move to another town, again.

ACCESS AND CONTROL

Many of us are sharing data about ourselves on the internet. We do this by using free email services and social networking sites and Twitter and Instagram, and through our web searches. In return we access free products and services, such as social networking, and email.

But we can't always control data about ourselves when it is held by someone else. We may not even know who is using our data or for what purpose.

In many cases, giving consent to particular, identified uses gives us some comfort and assurance about how our information is used. In other cases de-identifying the data or adding other levels of control increases protection and trust.

Consent is not always possible or desirable. There may be future uses of the data that were never imagined. There are cases where we are better off if people share data without consent or in spite of non-consent. Think here of being able to fight white-collar crime, child abuse, or to respond to a medical crisis where the patient is unconscious.





CHALLENGES, RISKS, AND TENSIONS

ACCESS AND USE – IN WHOSE INTEREST?

COMMERCIAL VS PUBLIC INTEREST

In some cases, sharing data can be commercially sensitive for companies, whereas access to the same datasets would be very useful from a public good point of view: for example, food and beverage industry data about consumption patterns that is used to target marketing campaigns of products effect considered to have a negative on people's health. The same datasets would be very useful for government to better understand and develop and target effective health promotion initiatives.

NATIONAL VS INTERNATIONAL INTEREST

In New Zealand we may have preferences about our privacy and the data we want to keep private, but we're not always in a position to decide which data to share or not. In many cases, we're dependent on regulations from other countries or the international community. For example, New Zealanders often don't like to provide a lot of identifying information about ourselves to overseas governments, such as the US Government, when traveling. However, if we want to visit the United States, we need to comply with their rules and provide digital scans of our fingers and thumbs, together with other personal identification data. The global nature of the Internet can also influence data-sharing behaviour in our country. For example, 'Internet piracy'; the practice of using the Internet to illegally copy software, music files, or movies and pass them to other people.

PRIVACY VS SECURITY

It can be in people's interest to share their personal information to access a particular public service, such as social welfare; but not for law enforcement agencies to be able to combat fraud and/or catch criminals. In this instance, the privacy interests of individuals need to be balanced with public-security interests.

PRIVACY VS TRANSPARENCY

Some people would like to keep certain datasets private, whereas for other stakeholders it would be of interest to access these datasets. Data about the water quality of lakes and rivers is a good example: for a dairy farmer it might be preferable not to disclose data on water quality of a river running through their farm, but for environmentalists, or people wanting to drink water from that river, it would be preferable to know the data.

INDIVIDUALS' PRIVACY VS PUBLIC INTEREST

People may not want to provide their personal data for research purposes, but it may be in the public interest to get the personal data to better understand national trends, behavioural patterns, problems, or intervention methods. Using personal data from children and their parents could help to better understand the problem of child abuse. Or data from people with breast or prostate cancer could be used to understand the effectiveness of national health programmes.





MISUSE

What if...

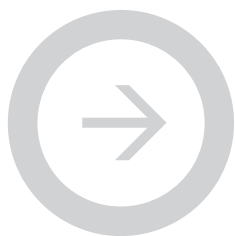
a public official
or government
minister wanted
to silence a
dissenting voice?

a violent ex-
partner wanted
to track down their
family who are
in hiding?

criminals or foreign
governments were
able to spy or steal
money and digital
identities?

a recovering
alcoholic or gambler
is bombarded by
ads from people
wanting to target
the addiction?

How easy would this be if private and personal details were known?
There is likely to be a power imbalance if new kinds of 'knowing' are not well handled by society.



INVASIVE USE

→ Data is already used to target you (e.g. for advertising) – this may not be harmful but may be annoying. If you dislike flyers in your letterbox, then what about their digital cousins?

→ In some cases, it can be materially harmful, such as if you are trying to shake off an alcohol addiction. How hard is this going to be when marketing companies focus on your past? When every time you walk down the road some billboard is hawking

your addiction to you, every time you log in, visit Amazon, Google, your email, someone is trying to sell you something.



MISUSE

THE INCREDIBLE STORY OF HOW TARGET EXPOSED A TEEN GIRL'S PREGNANCY

Gus Lubin, Business Insider Australia, 17 February 2012. www.businessinsider.com.au/the-incredible-story-of-how-target-exposed-a-teen-girls-pregnancy-2012-2



*... a new level of
customer tracking...*

"Target broke through to a new level of customer tracking with the help of statistical genius Andrew Pole, according to a New York Times Magazine cover story by Charles Duhigg.

Pole identified 25 products that when purchased together indicate a woman

is likely pregnant. The value of this information was that Target could send coupons to the pregnant woman at an expensive and habit-forming period of her life.

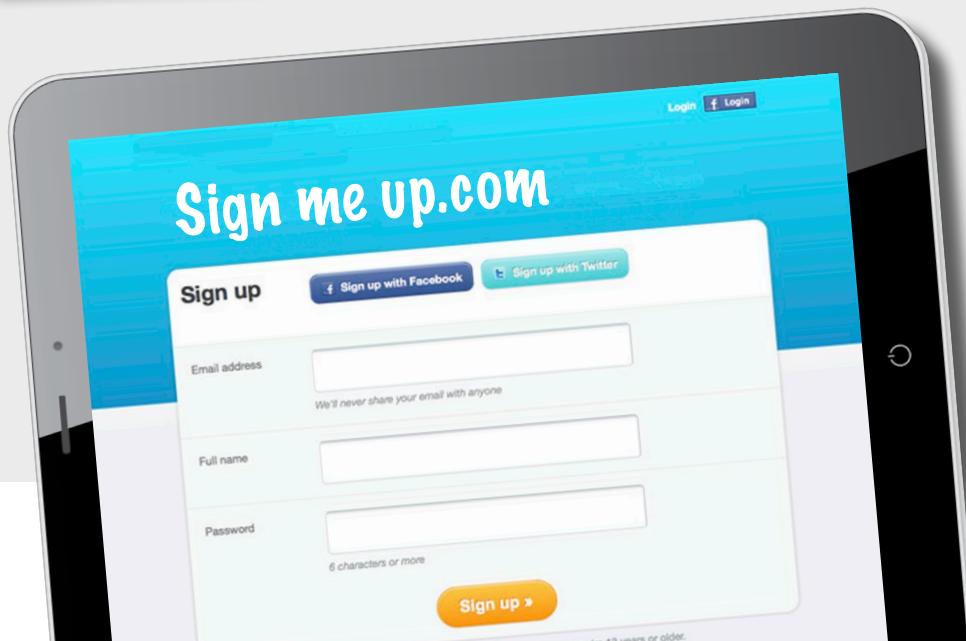
Plugged into Target's customer tracking technology, Pole's formula was a beast. Once it even exposed a teen girl's pregnancy:

[A] man walked into a Target outside Minneapolis and demanded to see the manager. He was clutching coupons that had been sent to his daughter, and he was angry, according to an employee who participated in the conversation.

"My daughter got this in the mail!" he said. "She's still in high school, and you're sending her coupons for baby clothes and cribs? Are you trying to encourage her to get pregnant?"

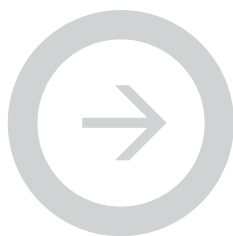
The manager didn't have any idea what the man was talking about. He looked at the mailer. Sure enough, it was addressed to the man's daughter and contained advertisements for maternity clothing, nursery furniture and pictures of smiling infants. The manager apologized and then called a few days later to apologise again.

On the phone, though, the father was somewhat abashed. "I had a talk with my daughter," he said. "It turns out there's been some activities in my house I haven't been completely aware of. She's due in August. I owe you an apology."





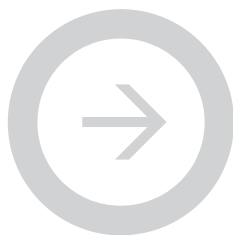
MISUSE



DISCRIMINATION

- Will data-driven insights be used to drive exclusion, based on correct or incorrect information?
- Consider the prediction of risk by the public or private sector. If some people's claims are true, then we will be using your eating, exercise, social history, and genetic profile to predict lifespans, heart attacks, and increased

risk of specific disease. When interests overlap you may get a better service such as increased access to health care. But what about when governments and insurance companies want to use this to manage their interests or to charge you extra? Do you have a right to keep this information away from insurance companies?



EXCLUSION

- If data underpins services in the new data environment, will some people lose the ability to get services if they chose not to be part of the data? If you are off the grid, will you be marginalised because insurance companies, banks or governments won't provide services?



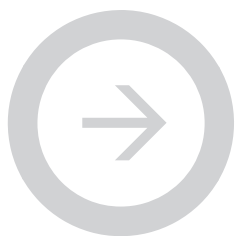
SCENARIO

**AS BOB DYLAN ONCE SAID,
"IT AIN'T ME BABE, IT AIN'T
ME YOU'RE LOOKING FOR"**

When I tried to visit my aunt in Sydney, I couldn't travel overseas. And my bank accounts were frozen. It turns out that my name and date of birth are an exact match with those of someone who has a criminal record and a lousy credit rating. It took a while to get it fixed with the bank, and meant I missed my aunt's birthday party. It's really frustrating when these things happen.

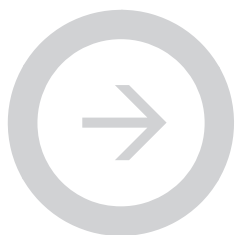


MISUSE



MALICIOUS USE

- Intentional but unauthorised use of data for negative aims, such as violence, theft, or other cybercrimes can have a big impact.
 - Data is becoming a more attractive target to criminals; it can help them to steal money or identities to conduct fraud or to target individuals.
-



'BIG BROTHER'

- As seen with the debate around the NSA, governments use data to fight crime, child abuse, terrorism, and for national security. Of course this is a benefit to most people most of the time. We want fewer bombs, and less crime and less dead kids.
- Looking ahead, we can't be certain governments will always use data benignly. Countries in Europe restrict the use of digital information due to the experience of Nazis using official records to round up the mentally ill, Gypsies, homosexuals, and Jews. The dawn raids of the 1960s, where the government of the day was busting down doors to find overstayers, raised real controversy in New Zealand. How much easier would that task have been if they knew exactly where everybody was? It's not just governments that are a potential risk in that regard either. What if a powerful person with access to your personal information used it against you?



SCENARIO

LOSING IT ALL

At first it seemed fantastic getting all these amazingly easy services through my smartphone. But then I tried to get into my email a few days ago, and the system wouldn't accept my password. Now I can't access anything on my computer, and my bank accounts have been emptied out. My credit cards have all been maxed to the limit and beyond – and my bank has called to tell me it's cutting me off, despite all the years I have spent conscientiously paying the mortgage. My friends and family have phoned to say they've had weird messages from me asking for them to send money. Someone has claimed my life and stolen everything from me.



CHALLENGING QUESTIONS



Who owns the data? Under what conditions could data be re-used?

In the new data environment, existing datasets will be reused and new data sets will be created. Will these datasets be owned by the entity disclosing or collecting the data, or will they be open by default? How are intellectual property rights managed and protected when data is increasingly shared?

What about data collectively owned by people, such as iwi data?

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Who controls the data?

Who has decision rights about the data: is it the data owner or another entity? Will decisions be made by a computer algorithm or a real person? Will datasets be publicly available for the common good of New Zealanders: a New Zealand 'data commons' if you wish? If so, who will be authorised to make decisions about the New Zealand data commons?

Can we consent to future uses of our data?

The value of data no longer resides solely in its initial purpose, but is often in the reuse of data – most of which isn't imagined when the data is first collected. How individuals give informed consent to a future situation? Do individuals need to opt-in to an open-ended, multi-purpose arrangement or are there other possible arrangements for informed consent we might be able to create? How could informed consent be arranged around new ways of collecting, processing, and using real-time personal data? Do children have digital rights to consent before a certain age? What about your, and your family's, rights when you die? Do we need digital wills?

Who will look after the data?

Who will look after the processing and storage of the (newly created) datasets? Where and how will data be stored, and for how long? Who will provide safeguards for data quality and data accuracy? And who is accountable when things go wrong?

.....

Can we opt-out of the new data environment?

Do individuals need an ability to opt-out in the digital age, similar to the way we can opt-out of target-marketing campaigns of telemarketers for example? Do we have a right to revoke our consent to use our personal data and, if so, how could this be arranged? Will the digital footprints you have made earlier in your digital life, such as the public posting of sensitive pictures, haunt you for the rest of your life or your relatives and friends after you die?



CHALLENGING QUESTIONS

How do we protect the digital rights of every New Zealander?

We are living in a pluralistic society with differences in cultural backgrounds and value perspectives. These cultural differences also influence our privacy perceptions and the types of data we are willing to share. How could we maintain our cultural diversity and be an inclusive society in which the digital rights of every New Zealander are protected? Can we make sure that the new data environment doesn't cause discrimination or negatively affect New Zealanders?

How does New Zealand ensure the best outcome for New Zealanders in a global environment where data crosses borders?

The major questions above are amplified when global sharing is considered. Companies like Google and Amazon hold a wealth of information about New Zealanders. It is of significant commercial value to them but what are the opportunities for productive collaborations that could benefit New Zealanders? Can we use the new environment to support global connections, for iwi with people living offshore, or for innovation? How do we manage off-shore situations where governments want to have access to New Zealander's personal information, or pan-national organised criminals - both of which are trying to access New Zealand data without your consent and becoming increasingly sophisticated about it. For a small country would this kind of development cut off key digital markets? What would be the effect on New Zealand's prosperity in a digitally run future?



NEXT STEPS





OPTIONS

New Zealand and New Zealanders have some difficult choices to make. Broadly speaking, there are four ways New Zealand could go. We think only one is realistic.

1 MAINTAIN THE STATUS QUO

New Zealand could use the instruments and regulations and capabilities that we currently have and seek to minimize risks and maximise benefits from the new data environment under the current regime. We will look at this option but it appears that maintaining the status quo is insufficient for adapting to an emerging future. It seems to us that it neither manages risk well nor facilitates the improved lives possible through data use and sharing.

2 FOCUS ON PRIVACY ONLY AND REDUCE THE ABILITY TO SHARE DATA

New Zealand could tighten up and focus on the risks and on privacy and make it harder to share data. We think that locking data up to minimise the risks is a bit like a retrenchment policy in the face of an oncoming storm – the future is upon us. We do not think it is realistic to isolate New Zealand, and it would make New Zealand a backwater - life would be unnecessarily hard when we could be getting real benefits from data use and sharing. There is possibly merit in waiting to see what emerges elsewhere first and not taking the risk of being the first adopter, but would this put us behind where we could be?

3 FOCUS ON ALLOWING INCREASED DATA SHARING

We might decide these risks are not great and that the benefits far outweigh the risks involved in information sharing. This implies opening the door and not worrying too much about the risks. After all, some might say: isn't this all just about a small minority of people and theoretical risks? Well, no, we don't think so – open slather data sharing would put New Zealanders at very real risk. It would be foolish not to try to minimise the potential harms that arise from the use of shared data.

4 TRY TO MAXIMIZE THE BENEFIT AND MINIMISE THE HARM OF THE NEW DATA ENVIRONMENT

We in the Data Futures Forum think it's worth finding a way to have our cake and eat it; improving both sides of this equation at once. We want to consider ways to maximise the benefits and minimise the harms of this new technology and this new kind of future. Therefore we think the dialogue should be about how New Zealand can adapt to a data-sharing future in a safe and effective manner.

We want to hear your views 



WHAT DO YOU THINK?

We want your input, so we can make New Zealand a world leader in the trusted use of shared data, to deliver a prosperous, inclusive society

What do you think about New Zealand's possible data futures?

What kind of benefits and opportunities should we be aiming for?

How can we make it easy to share and use data when it is required?

What risks and challenges need to be managed?

Are there privacy-friendly ways to access and use data?

How can we protect the interests of New Zealanders and New Zealand?

What will a sustainable and adaptive environment for data sharing and use look like?

PARTICIPATE IN THE DISCUSSION. HERE'S HOW:

- Visit our website:
www.nzdatafutures.org.nz
- Email us with your views at
info@nzdatafutures.org.nz
- Comment on our
LinkedIn discussion page
- Come along to events and conferences where we will be presenting
– **find out about these on our website**
- Invite Forum members to speak at events or discussion groups
– **contact us via the website.**



WHAT'S NEXT FOR THE DATA FUTURES FORUM?

Over the next few months we want to hear from you.

Between March and June 2014 the members of the Forum will engage with stakeholder groups, including business, government, NGOs, Māori, and researchers. This will stimulate lively informed debate and ensure all issues are on the table and all perspectives are heard and understood. The Forum will also use media channels to inform, and educate and be educated by, the New Zealand public. We will look for input and advice on two further papers. These will springboard off the questions raised in this paper and the perspectives you share with us through engagement and debate.

Our second paper will look at some broad principles we wish to test with you. If New Zealand is going to improve its ability to share data more often, and more safely, on what basis should we be doing this? What would success look like? What must any specific solution need to address to be a good solution?

Our third paper will consider what, if any, kinds of specific solutions might be adopted. We haven't looked hard at this yet. We are hoping you will share your creative solutions and ideas to help shape this. We will have something to say about how well these specific options fare against our principles. No doubt you will too.



