The 2017 conference theme is *Creating pathways to 2050: liveable spaces and loveable places* with a future focus on infrastructure, place making and community engagement.

Although this session is focused on **Building tomorrow's places 2050: the role of technology** it cannot be separated from the broader themes of the conference - it is all about place making and community engagement – in other words; it's about people.

As you are aware, Christchurch experienced a set of devastating earthquakes in 2010/11. The first 4 September 2010 and the last of the largest aftershocks on 23 December 2011. This was the one on 22 February, which changed our world forever.

But in the gaps that were created, we can see opportunity - the opportunity to build back better, smarter and more resilient.

This has not been without its challenges – the kind of infrastructure and the decision making structures are still largely based on 20th century systems and technology, and data tends to be locked up in siloes – both within agencies and between agencies. Siloes are the biggest barrier to developing flexibility and resilience.

Overcoming those is one of the keys to unlocking the opportunity to future-proof our city.

There is an inspirational saying which says: *When written in Chinese, the word 'crisis' is composed of two characters. One represents danger and the other represents opportunity.* Just because John F. Kennedy said it first and it's been repeated many times, doesn't mean it's true. And it's not. But the correct interpretation is even better.

Weiji is the word for crisis and it is made up of two characters - wei is danger and ji is that incipient moment, which is the crisis point – danger is imminent. Jihui is the word for opportunity.

And there is that character ji again - that incipient moment, which in this case brims with opportunity. So crisis is the character that can produce danger or it can produce opportunity and it is that magic moment of time that we are experiencing in Christchurch right now where opportunity abounds.

Disaster to opportunity

Crisis
危机 Wēijī
danger + moment
Opportunity
机会 jīhuì

"When written in Chinese, the word crisis is composed of two characters. One represents danger and the other represents opportunity"
JFK

5   Christchurch City Council

As a city, Christchurch is proof that with disaster there always comes opportunity.

And our opportunity has come at an interesting time in world history – the convergence of accelerating global urbanisation and an exponential digital revolution. I'm reading Thomas Friedman's book 'Thank You for Being Late: An Optimist's Guide to Thriving in the Age of Accelerations'. It's the sense of opportunity and optimism that has driven Christchurch to embark on a Smart City programme, as part of our commitment to creating pathways to 2050.

My favourite book is If Mayors Ruled the World. I usually get a laugh when I say that, but Benjamin Barber's theme is contained in the sub-title - Dysfunctional Nations, Rising Cities. Pandemics, climate change, global terrorism don't respect a country's border. It is at the city level, that we can build resilience to such events. We are seeing a devolution of power to cities, which are so much closer to the action, and the ceding of power upwards to global governance structures based on cooperating cities – like the C40, the newly established Global Parliament of Mayors, international city networks like the 100 Resilient Cities Network pioneered by the Rockefeller Foundation and Mayoral Compacts and commitments. Urban pragmatism is displacing national ideology – look at the reaction of major US cities in response to the United States' withdrawal from the Paris Accord.

So we are at an interesting time in world history. I often say, the future's coming ready or not – I'd rather be ready.

The future's coming ready or not…

Thank You for Being Late
AN OPTIMIST'S GUIDE TO THRIVING IN THE AGE OF ACCELERATIONS
THOMAS L. FRIEDMAN

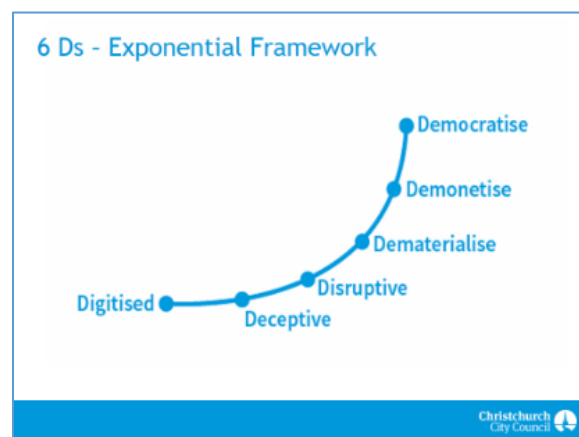BENJAMIN R. BARBER
IF MAYORS RULED THE WORLD
Dysfunctional Nations, Rising Cities

…I'd rather be ready

3   Christchurch City Council

But being ready means having the capacity to confront the exponential curve that we will face. It is vital to remind people of the 6Ds, because they remind us that sometimes you just don't see it coming (that's the way of the exponential curve) and although democratisation is the ultimate prize, the deceptive nature of the beginning of the curve and the disruption can cause pain along the way. Cities need to be ahead of the curve. And that's what I want for Christchurch.

6 Ds - Exponential Framework

Democratise
Demonetise
Dematerialise
Disruptive
Digitised
Deceptive

Christchurch City Council

Obviously Christchurch has been given the opportunity to build back better - innovation in seismic and environmental design have enabled buildings to have more resilience, making them more sustainable and cost effective across the whole of the life of the building. The Engineering School at Canterbury University has been driving innovation for decades and they have produced engineers that can be found in top

practices and universities the world over. Innovative technologies developed here have found their way into new builds and innovative retrofits.

This is Forte Health Medical Centre, rated at 180% of New Building Standard; it has two world first energy dissipation units incorporated in the design.
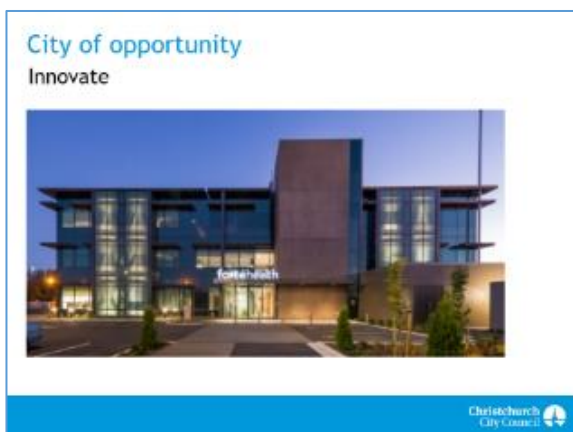
The Art Gallery story is not so much about the base isolation, but the ground stabilisation which saw 124 jet grout columns between 3-4m in diameter and up to 6½m deep, and the
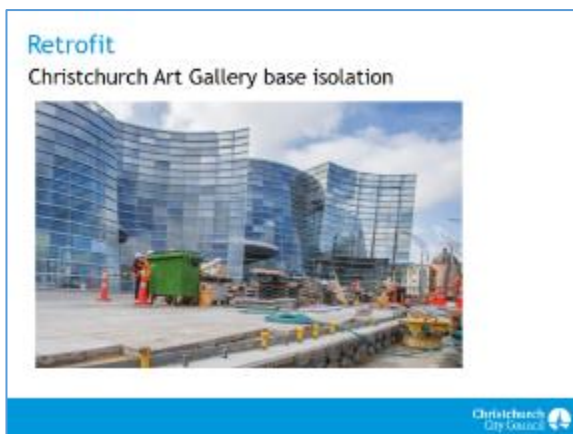
relevelling of the building which involved: 1.5m litres of grout over 44 days – lifting the gallery on average 2mm per day, with lifts of up to 182mm required in some areas.

And it is a smart building – forming part of a growing network of monitored buildings in Christchurch; this image is the Justice & Emergency Precinct (which is almost finished)]. Few buildings in Christchurch are currently equipped with sensors. But they are absolutely the way of the future – and the business case easily stacks up on whole of life costs.

In some parts of the world structural monitoring is legislated, but in NZ it's voluntarily undertaken by a growing number of developers and tenants as it's seen as an asset for a building that provides data to support decision-making. The capital cost and on-going maintenance costs of structural monitoring are similar to fire and security, however, the return on investment is applicable throughout the life of a building as it is also a tool for building maintenance and operation. Sensor monitoring in buildings is a tiny fraction of the building cost and can be retrofitted or put into new builds and should become the norm for developers and tenants. I've listed the reasons there:

- A monitored building gives the people working and/or living in it, **peace of mind**
- It **Removes subjective conversations** and replaces them with observed data – potential benefits for meeting health & safety obligations- gaining insurance cover.
- Understanding how a building preforms in **everyday conditions**
- **Measuring impact** on a building from seismic events and also neighbouring construction or wind events
- **Faster and better informed reoccupation** after seismic events – it can costs 10s of thousands of dollars

a day depending on the numbers of staff.
- Evaluating and constantly improving **earthquake-resistant design**

The use of BIM in the Justice & Emergency Services Precinct involved production of a very detailed model ahead of construction. A laser grid is projected onto the site with accuracy down to the millimetre and contractors can use a laptop to pick up the projection and view detailed models as they work on the building.

The site is continuously scanned as work advances and an as-built model is produced from the scanned data. Every last detail can be checked by comparing the original BIM model against the as-built model.

This process has saved a huge amount of re-work. The project managers monitoring the BIM model can be certain that nothing is missed out during construction. Automatic clash detection software ensures that all elements go together well and things like pipes don't end up in the way of other elements like a ventilation duct.

Once the building is complete the as-built model will be invaluable for maintaining the building as maintenance staff can look to see exactly where a problem might be located or can use inventory logging to do things like checking to see how many of a certain switch type the building might have and where they are located. This would be useful if one turned out to be faulty and the building managers wanted to check the rest.

Building Information Management

- Peace of mind
- Removing subjectivity
- Building performance in everyday conditions
- Measuring impact
- Faster & better informed reoccupation
- Evaluating & improving earthquake-resistant design

Christchurch City Council

In terms of how we are creating a smart city programme, we are using a jigsaw as a metaphor for our approach – putting it together requires a bit of trial and error. As you can see people are placed at the centre of development - collaborative planning and citizen participation are vital. As you will see we are aiming to develop approaches that empower citizens and enable highly responsive services.

Christchurch's size means we are big enough to trial things that are scaleable, but and more importantly, we are "small enough to fail".

The Smart Cities programme shoulders the risk that always sits with innovation – they are programmed to learn fast. They use trials and they leverage existing data / technology / initiatives.

It is Free & Open Source and all the code is published on GitHub – enabling others to leverage off the work we are doing. And we're Mobile first… with responsive design for all screen sizes.

The next few slides will show you some of the parts of the jigsaw.
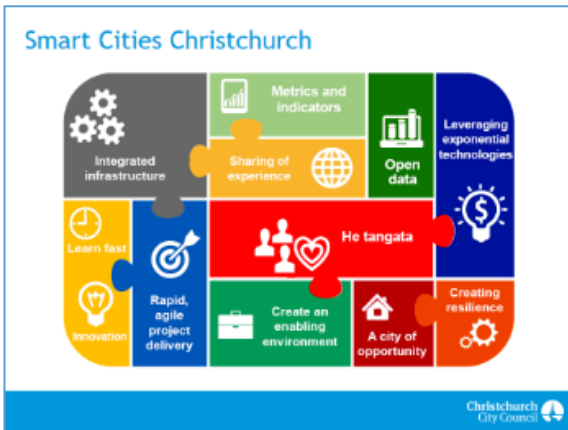
smartView has been developed with the goal of becoming the go-to digital destination for Christchurch visitors and residents. The code for smartView will be available on Github for other cities to use or interested developers to branch off and create new functionality. The various data sources used will be clearly labelled with source information and any constraints regarding re-use.

I'm told that "The mayor wants a **city dashboard**" was the rallying cry that kicked off the Smart Cities Operational Dashboard (SCOD) initiative and thus the concept began of providing one view of 'as real-time as possible' city data.

Snap Send Solve is a user-friendly app that can be used to report all types of issues including graffiti, blocked drains, fallen trees, broken playground equipment, suspected pests, rubbish and more. It works by identifying the location the photo is taken using the phone's GPS data. It then sends an email to the council, including the picture, which is then allocated to the relevant department. I have challenged the team to
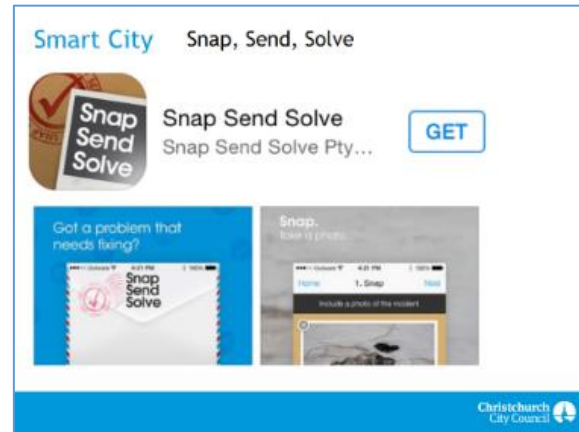
produce Solved, Snap, Send with thanks!

We were only 3 months into the 6months trial of the Bigbelly solar compressing bins when we had already gathered some compelling data:

- Rubbish removal has drastically reduced
- Litter in the area has been virtually eliminated
- Negative comments on Social media and to the call centre have ceased
- 100% seagull proof

But they don't pass the streetscape design test, so we are working with a local company to produce rubbish bin level sensors designed specifically for our existing bins.

Our **Mobility Parking** proof of concept is a win-win solution for both mobility park users and providers. Unlike other carpark sensors, these are a custom IOT sensor designed by a local company inFact. The device will stick on to the road like any other road marker and contains multiple sensors, most importantly, a bluetooth sensor that matches to a bluetooth tile attached to the mobility parking permit (which could alert enforcement officers to vehicles using mobility parks that don't have the appropriate mobility card identification. An app will accompany this solution that informs drivers of mobility parking location and availability.

The Smart Bikes' trial tests their capacity to read public transport travel cards and are equipped with GPS technology.

Sensor Network We are establishing a sensing platform using Kites, which act like a USB port – where you can change the sensor without having to replace the basic infrastructure.

We are also currently calibrating an **Air Quality** sensor which costs $300 against the standard $60K sensor. While this sensor won't be as accurate, the standard deviation should be able to be modelled and we should be able to obtain much more rich data and identify sources of problems more quickly.

Sensibel is the product trialled by Christchurch's FabLab, Fabriko, our partner organisation for this proof of concept project. This geotags and records commuters' experiences through a physical device fixed on the handlebars of a bike or via an app for bus users. Feedback from cyclists was that they wanted one button that could be pushed once for a positive experience and twice for a negative experience which has led to the second prototype (currently in development).

Fabriko's solution is different to normal crowd-sourced cycle data provided by apps such as Strava in that it communicates commuter **experience** rather than just route, time, distance, GPS, or count data. A bus user can note when the bus is late or on time, or when the bus driver has been friendly and

polite. A cyclist can notify of pot-holes, dangerous merging lanes on a road, or the great experience of a recently opened major cycle route.

Smart Cross is an interactive touchscreen device that allows pedestrians to play pong with each other while they wait to cross the street. It encourages pedestrians to wait while the man is red, and to give them something to do while they're waiting to cross the road - people can interact with pedestrians on the other side of the road and it is wifi-enabled, which means is we can be pushing out community messages at the same time.

The last initiative that I will mention is in the early stages of development for us, but is relevant to every city and district that wants to reinvigorate volunteering in the digital age. Be Collective is an online tool that mobilises people in the spirit of community engagement. It's free for individuals and volunteer groups to use - but Councils can get a premium membership which will provide access to the data and analytics for your region. Our Smart Cities programme is providing funding for the first year which will give operational teams an opportunity to assess its usefulness and provide the early adopter buffer that is necessary as we gauge the uptake from individuals, volunteer organisations, agencies, and organisations.

Be Collective has the potential to make a step-change in the way we can interact and engage with our communities, encouraging a new generation of volunteering.

Even before I was elected Mayor, I was determined that Christchurch would become part of the 100 Resilient Cities Network pioneered by the Rockefeller Foundation. I was motivated to join a network that understood that resilience was a journey not a destination. And that it was not just the capacity to respond to adversity, but also the ability to thrive in the face of challenges we might have to confront.

The words that jump out of a word cloud on resilience emphasise creativity, respect, diversity and adaptation. Resilient cities, smart cities, sustainable cities, healthy cities – they are one and the same.

Smart cities are resilient

In Christchurch we are taking advantage of the opportunity that disaster has provided. We have become a hotbed of innovation; a real life living laboratory for the technologies of the future. The autonomous shuttle is being tested in Christchurch at the airport.

A Hotbed for Innovation

We are developing a shared fleet of electric vehicles. We are determined to be ahead of the curve.

A Hotbed for Innovation

We are New Zealand's oldest city – and now we are becoming New Zealand's newest city.

We have redefined ourselves: Christchurch is a city of opportunity - we are open to new ideas, new people and new ways of doing things - a place where anything is possible.

We can help find solutions to global problems; we can take a leadership role on the challenges of sustainability and climate change; we can lead the way.

Proud of our history, prepared for an uncertain future, equipped with the knowledge that we have, within our communities, the ability to take on any challenge – that is Christchurch's story.

My message to you is you don't have to wait for a disaster to take advantage of this sense of possibility – now that would be smart.

Christchurch is a city of opportunity…
…we are open to new ideas, new people & new ways of doing things…
…a place where anything is possible