CANTERBURY BANKSTOWN

2021 & BEYOND

Contents

> **"Education is our passport to the future, for tomorrow belongs to the people who prepare for it today."**
>
> | **Malcolm X**

> **"The most reliable way to predict the future is to create it."**
>
> | **Abraham Lincoln**

> **"Those who look only to the past or the present are certain to miss the future."**
>
> | **John F. Kennedy**

Why the Future Matters

Technology is moving at an exponential rate. Each week there seems to be new technology, capabilities, or software emerging, making it extremely challenging to keep up to date with valuable tools that can drastically improve how Council provides our services.

Here's where this document comes in. Future Forecast is a snapshot of four emerging tech domains that are front of mind for the City Future department, summarised in a way to make it easier to understand, explore, and leverage new technology to support our work.
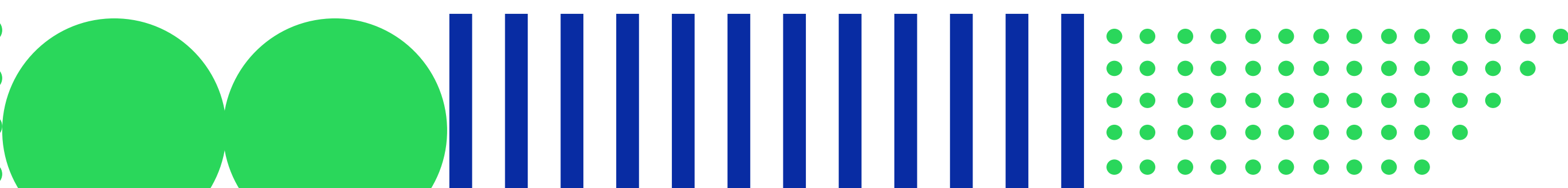
A Message from the Director, City Future

When the City Future Department was created in 2016 we set out our purpose to "dream, design and create the most amazing future for our City". But I recognise it is not just City Futures' role to make a bigger difference in the world around us – you all have a role to play in looking to the future.

With 2020 in the rear view mirror, I am sure many people are not wanting to revisit the past and the challenges COVID brought. However, it has allowed us to do things differently, some of it for the better. What is has shown us is three things:

1. We can change, despite the challenges it brings
2. No matter how well we plan for the future, we can't predict it
3. Not only is the community and environment changing but the pace of change itself, is changing.

The consequence of this is that there often isn't a single solution to the problems ahead. Our challenges are wicked, disruptive, and require new and inventive solutions - and key to this will be a blend of technology with an innovation mindset.

This Future Forecast report is just one tool designed to help uncover and demystify some of the technologies making a splash in 2021. Artificial Intelligence, digital twins, the digitisation of services, and recognition technologies are already here, and here to stay. For CBCity, it's not about if we pursue these technologies, but when.

Designed to be a 'thought provoker', it's my hope that you use this document to start a conversation about the future, the possibilities for doing things different, how change and disruption will impact on your area, and how technology can be part of that.
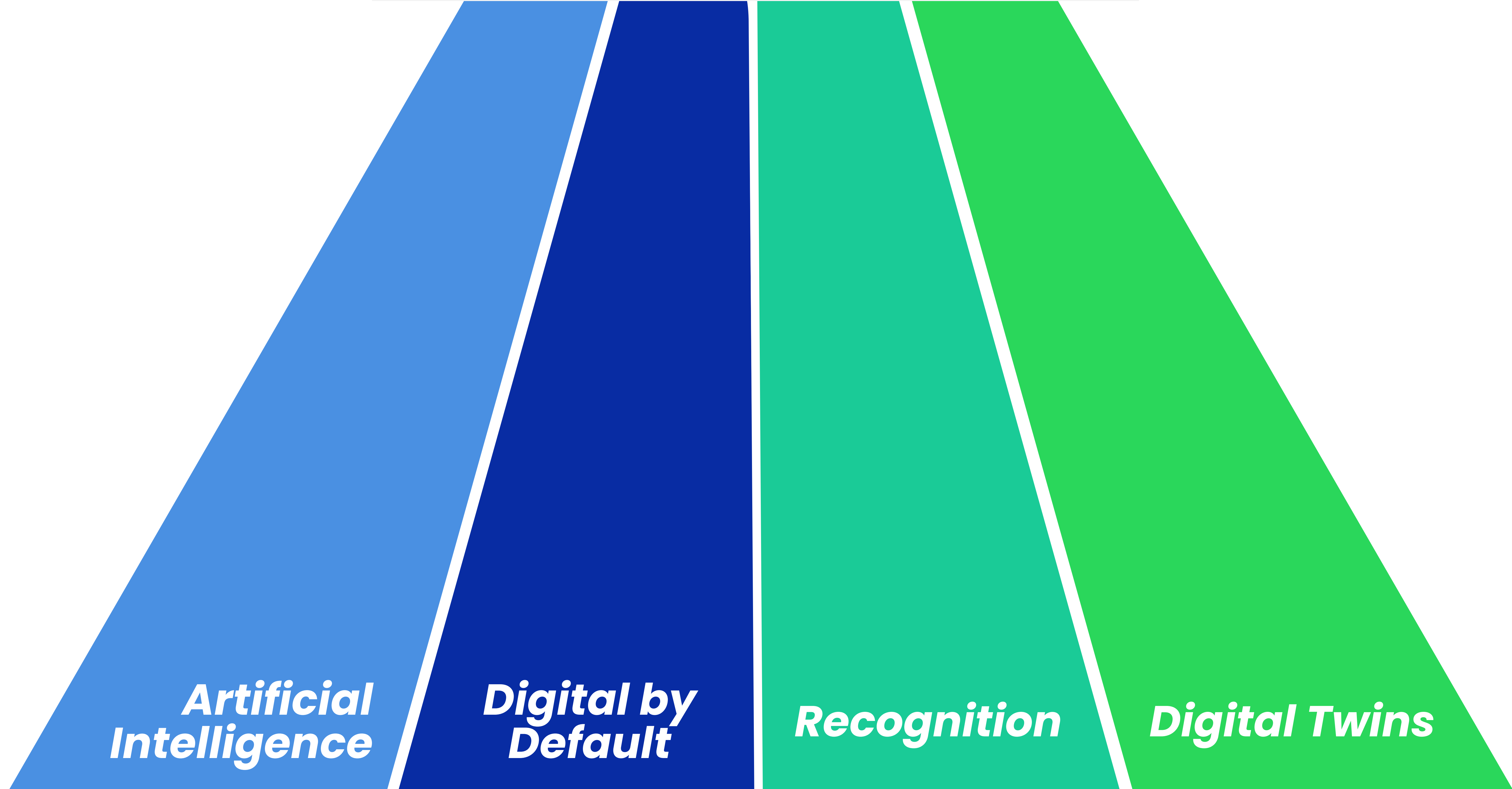
I'm looking forward to seeing what ideas you have to join us to create an amazing future for our City.

James
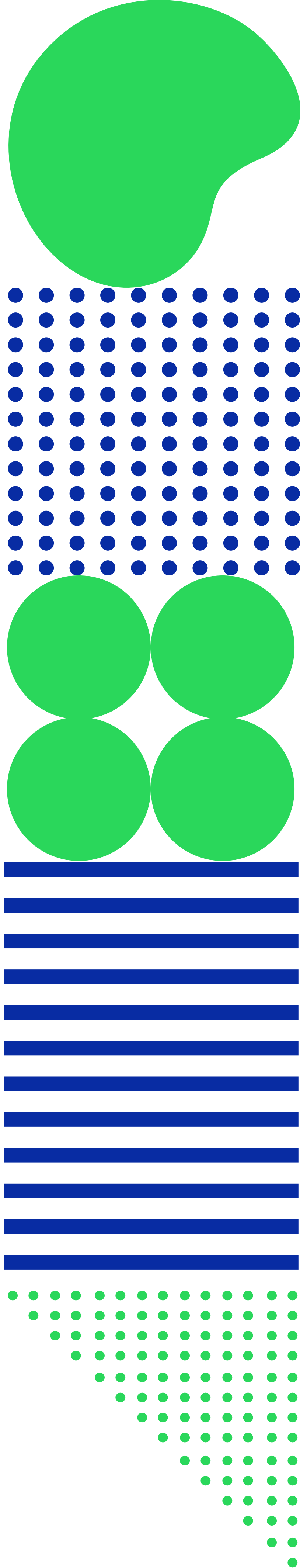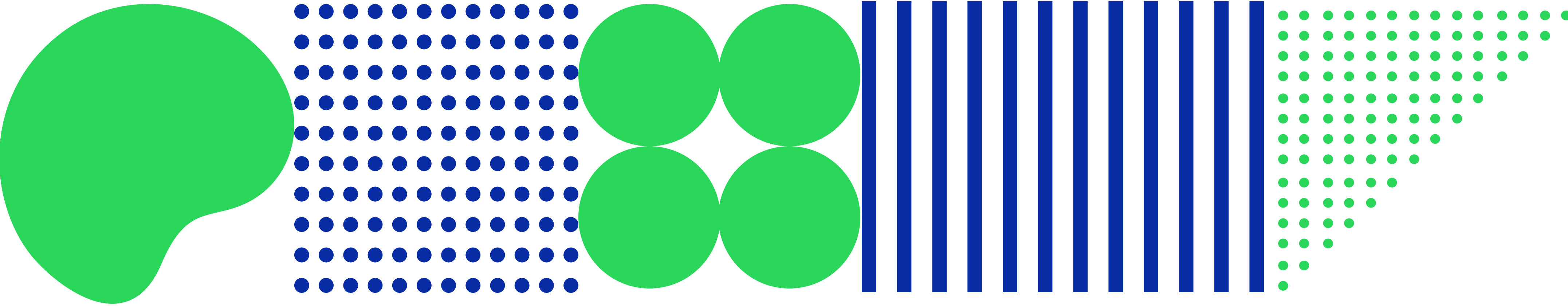
Emerging Domains

Artificial Intelligence

Digital by Default

Recognition

Digital Twins

Artificial Intelligence

What is it?

Artificial Intelligence (AI) has advanced significantly over recent decades, disrupting virtually every industry from transportation (self-driving cars) to advertising (personalised recommendations). AI is pinned to continue being one of the most important technological advances for the world, but what is it really?

Artificial Intelligence is the ability for a machine or computer to behave intelligently. This intelligence might include understanding and writing human language, recognising images and sounds, making optimal decisions, and solving problems based on the information available.

Understanding & writing human language

Recognising objects in images

Decision making in fraud detection
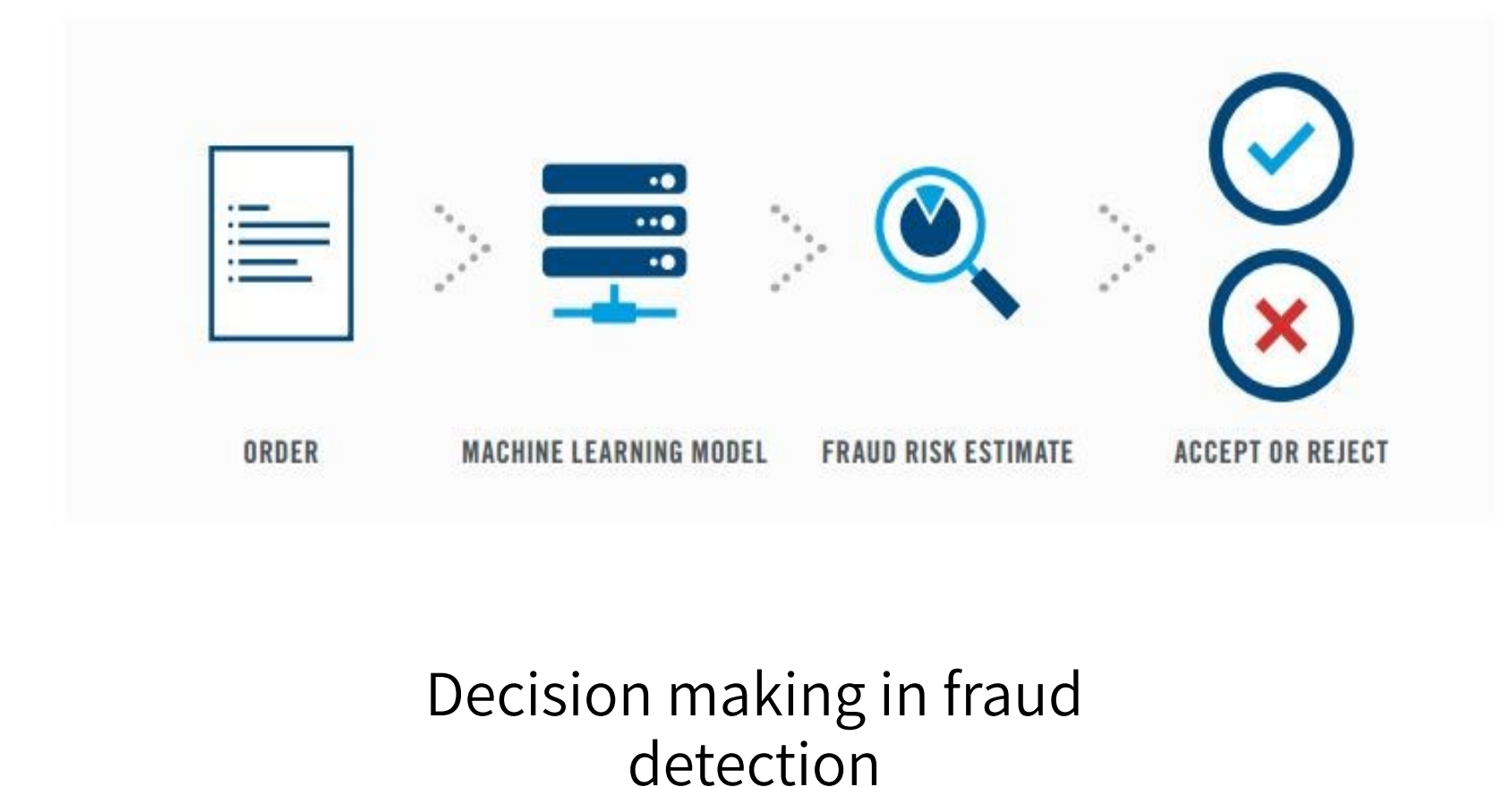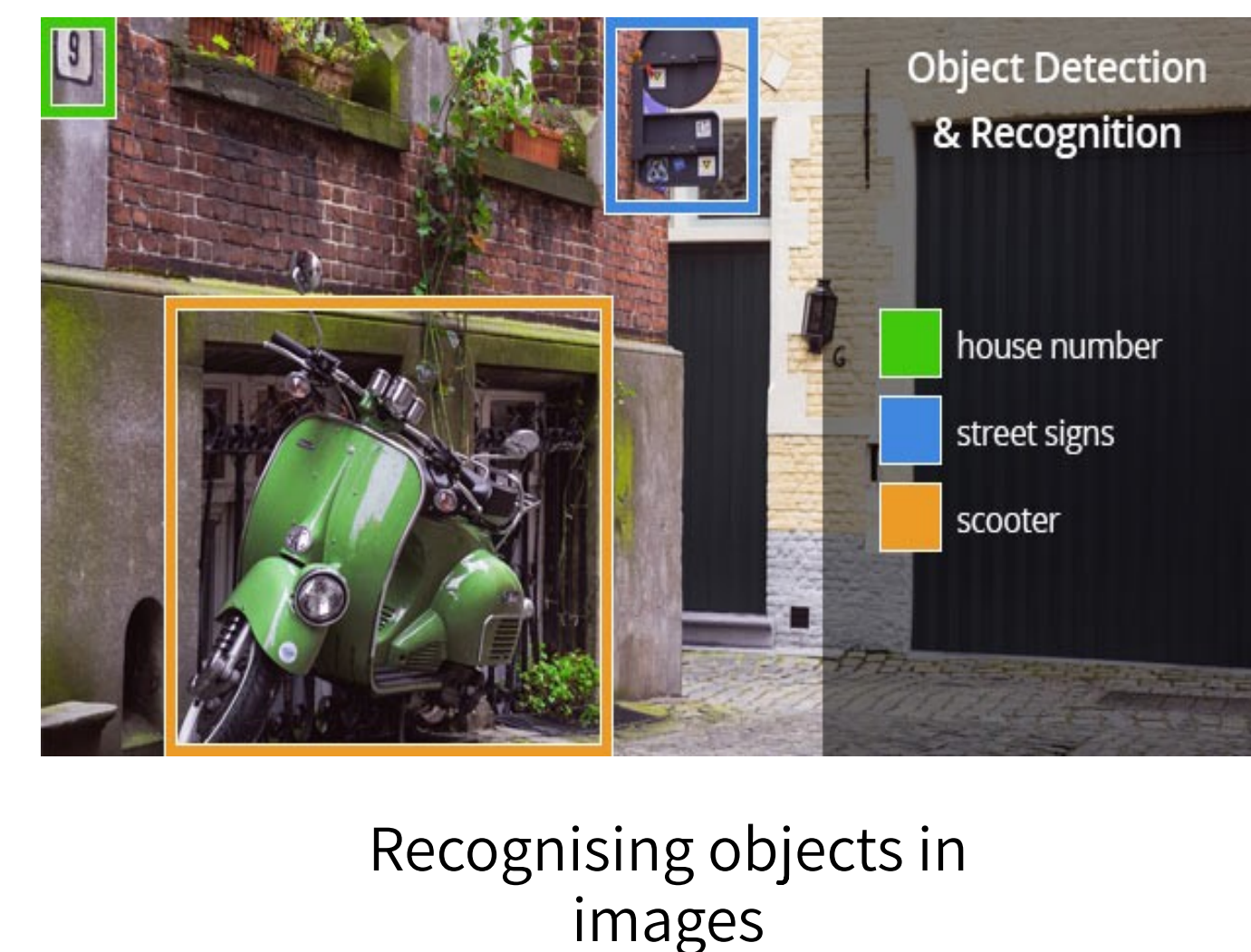
It learns to do these things the same way that humans do. When you learn to drive you're instructed as a rule: stop at stop signs, stay between the lanes, don't hit pedestrians. These are rules that you adhere to, the same way self-driving cars do. When your partner wakes up earlier than you, they've learnt to start the coffee machine because they know you want a steaming cup right when you wake up. Smart home appliances can do the same, learning your preferences to get your early morning coffee ready. And when you're learning a new language and pronounce a word incorrectly, you'll get feedback to correct you. Surprise - so does Google Translate.

It's important to understand the basics of how AI works because it lets us think up great ways of how it can be used.

How is AI being used currently?

What does this mean for CBCity?

AI is driving more things than you might realise. Just during the morning, AI can wake you up to your favourite song and update you with the news it thinks matter to you. It will calculate the fastest route to work based range of factors like congestion, school zones, and road work. It will filter out the spam calls so you can drive in peace to work, and it will help you park when you get there.

There are plenty of untapped AI solutions to support better decisions and faster processes at CBCity. These are just some. Keep in mind AI is flexible and has an incredibly broad range of applications, so reach out if you want to explore possible AI solutions.
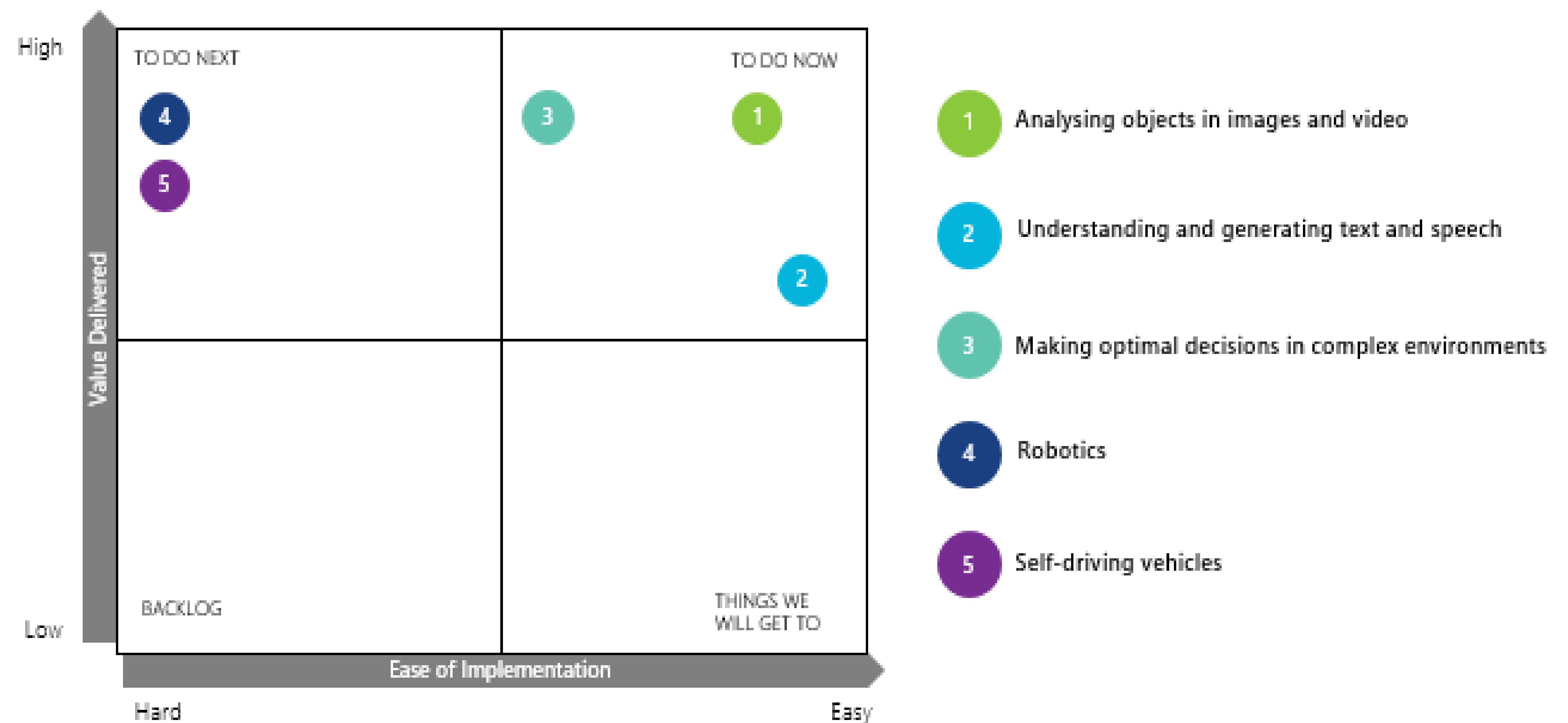
1 **Analysing objects in images and video** (also see Recognition trend) **–** which is useful for anything that requires visual inspection.
- Image recognition for remote inspection of assets, recycling, compliant works, illegal dumping, parking, and graffiti;

- Video analytics to identify movements and activity – how do pedestrians move in a throughway, how do they interact with park furniture, and how are they feeling doing so, happy? Confused? Bored?

(2) **Understanding and generating text and speech** – which is useful for automating simple, repetitive tasks.
- Analysing text from emails or messages to classify request types and automate the next course of action;
- Reading and entering data from paper forms into systems;
- Transferring inbound invoices and extracting key data fields automatically;
- Analysing resumes to prioritise candidates;
- Sifting through social media talk to identify customer sentiment and feedback; and
- Chatbots and virtual assistants to support staff and customers.

(3) **Making optimal decisions,** with all the information, including:
- Route optimisation for trucks and sweepers in real-time, dependent on traffic, weather, construction and incident data;
- Smart energy and water use by ensuring our offices are the right temperature based on the number of people in the room and daylight availability, or reducing sprinkler water usage if it's rained recently;
- Dynamic pricing to manage parking demand. Uber and Lyft use AI to carefully calculate ride prices to balance the number of drivers available, and the number of waiting passengers; and
- Asset maintenance prioritisation based on expected rate of deterioration and associated costs.

(4) **Robots** are already in use today but are typically used in large-scale environments (agriculture, factories etc.). In the near future, robots will become more accessible for a broader range of activities, supporting tasks like lawn mowing, drone delivery, recycling sorting, and waste collection.

(5) **Self-driving vehicles** are a guaranteed part of our City's future so we need to decide how we'll engage with them - how will they affect parking, road infrastructure, fleet management? How will we prepare and maximise what self-driving vehicles can offer?

What should we keep an eye on for the future?

Digital by Default

What is it?

We can't really talk about 2021 without mentioning the main act of 2020 - Covid-19. The pandemic disrupted almost all aspects of life, but it particularly drove one big outcome - the need for digital by default.

Digital by default describes the digitisation of our services. While digital experiences were once a nice-to-have, in an increasingly online and post-Covid world, they are now a necessity. It should be noted though, that digital by default doesn't replace in-person services with digital-only access, but instead ensures there are always digital options available.

Why is this important? For a few reasons. 1) We need to keep providing services despite Covid-19 restrictions. 2) Customers are already expecting digital services in many aspects of their life and 3) Digital done right is more economical and efficient than in-person and telephone services.

Channel	Total annual volume (millions)	Forecast channel volume in ten years (millions)	Cost per transaction (AUD)
Face-to-face	84.1	42.6	$16.90
Telephone	139.0	70.3	$6.60
Postal	97.4	49.3	$12.79
Online	490.0	648.4	$0.40
Total	**810.6**	**810.6**	

Cost of government services by channel (Deloitte, 2015)

Where is Digital by Default being done currently?

Everywhere. Our dining out is now food delivery, our new banks are 100% online, we can do entire university degrees online, and can order close to everything with just a tap of a button.

What does this mean for CBCity?

In terms of digital by default in government, we look to the most successful e-governments - see Denmark or Estonia - are the ones that centralise all their services and up-to-date personal information in a single, user-friendly portal for citizens. Denmark provides digital access to more than 2000 services, from changing a home address to enrolling a child into school.

To meet rising customer expectations, improve process and cost efficiency, and create new channels to increase accessibility to Council services, digital by default becomes an imperative.
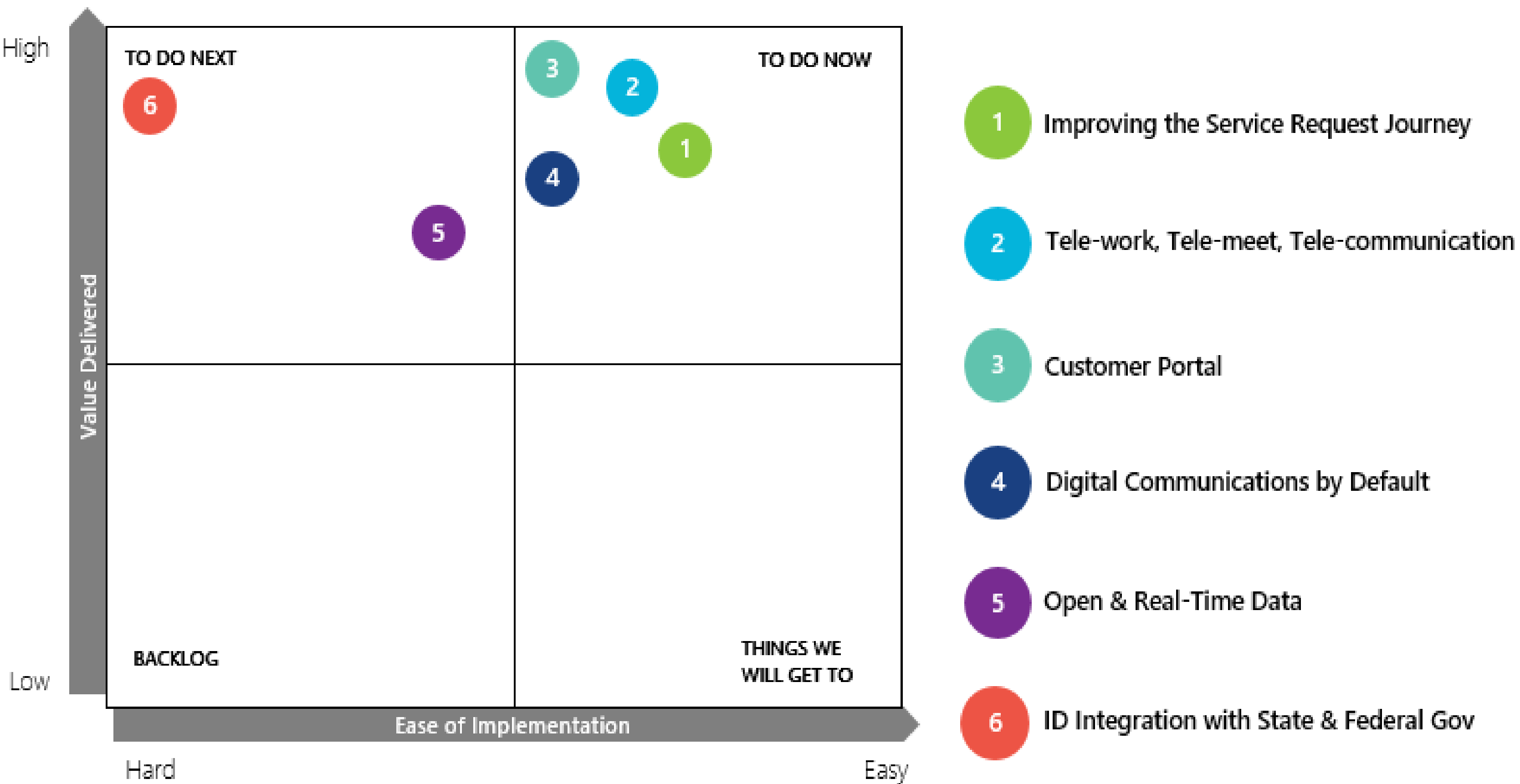

1 **Improving the Service Request Journey.** We currently have a disjointed and fairly manual service request process. There is little visibility to the detailed status of request, estimated completion time, and timely notifications to the customer. Digitising how we manage our requests and communicate updates with our customers will improve satisfaction and reduce callbacks.

2 Tele-work, tele-meet, tele-communication. This is both internally- and externally-focused. As an organisation we stand to support flexible work practices. This would include remote or teleworking practices.
Externally, our Council meetings, LPPs, Traffic Committee meetings and so forth should be made digitally available, in real-time. Many Councils are sharing Live Sessions and video dial-ins, this practice should continue in a post-Covid world to ensure we address physical accessibility limitations.

3 Customer Portal. This is a big one and has always been the crux of a sophisticated e-government, capturing important payment and rates information, service requests, and membership information.
Though CBCity is on its way to creating this one-stop-shop portal, a little haste won't hurt.

4 Digital Communications by Default. Many of us expect communications through digital channels like our mobile phones or email. These provide timely, cheaper, and more environmentally sustainable means to communicate with community members. Ensuring we have data governance and integrity in place is an important prerequisite for these speedy communication methods.

5 Open & Real-Time Data. Did you know sports field availability is one of the most visited Council website pages? But unfortunately checking real-time availability is still a phone call away. Having this and parking availability, library room and computer availability and pool capacity data shared in real-time can assist with leveling demand.

6 ID Integration with State & Federal Gov. Denmark is such a successful e-government because it integrates across municipality and federal lines. Having a single ID for all residents provides accurate, holistic information for government, and simpler, centralised services for citizens.

Recognition

Recognition involves the identification and classification of objects, people and everything in between using AI and other technologies like cameras, microphones or biometric scanners.
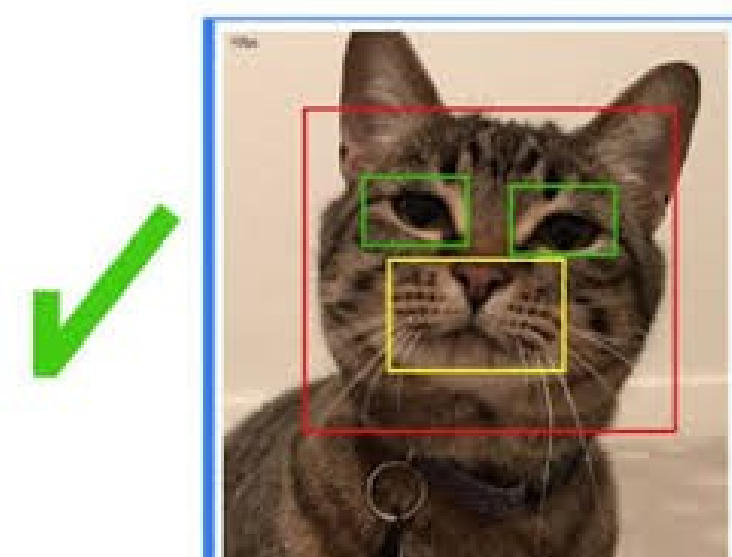
We can think of recognition working the same way humans do - we first sense (by sight, sound, touch etc.) a particular person or object, interpret these things and then put a name to that person or object, e.g. Jess Smith, a cat, or an illegally dumped mattress.
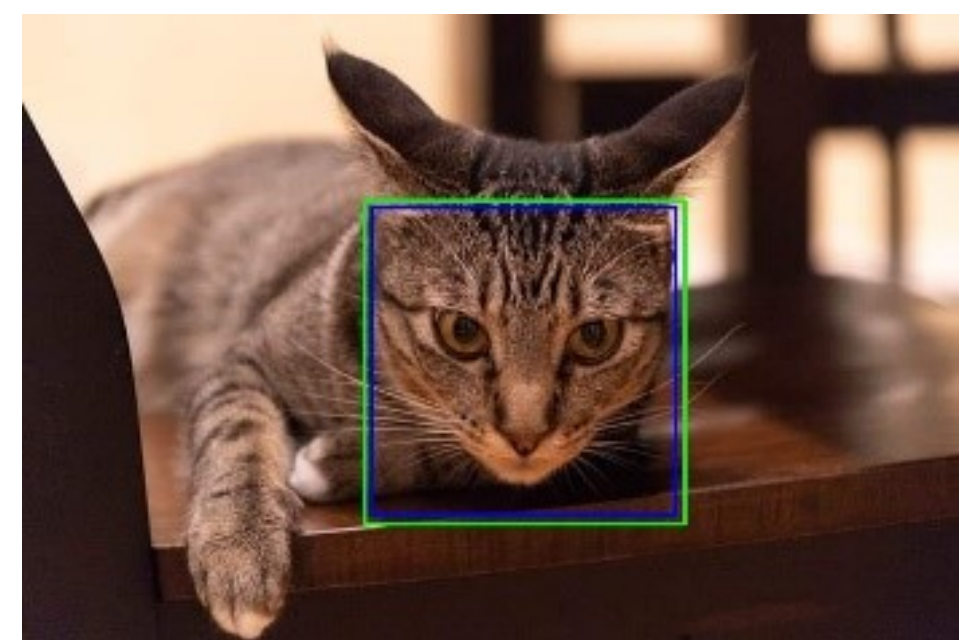
Images and videos are used as 'sight' and 'vision'
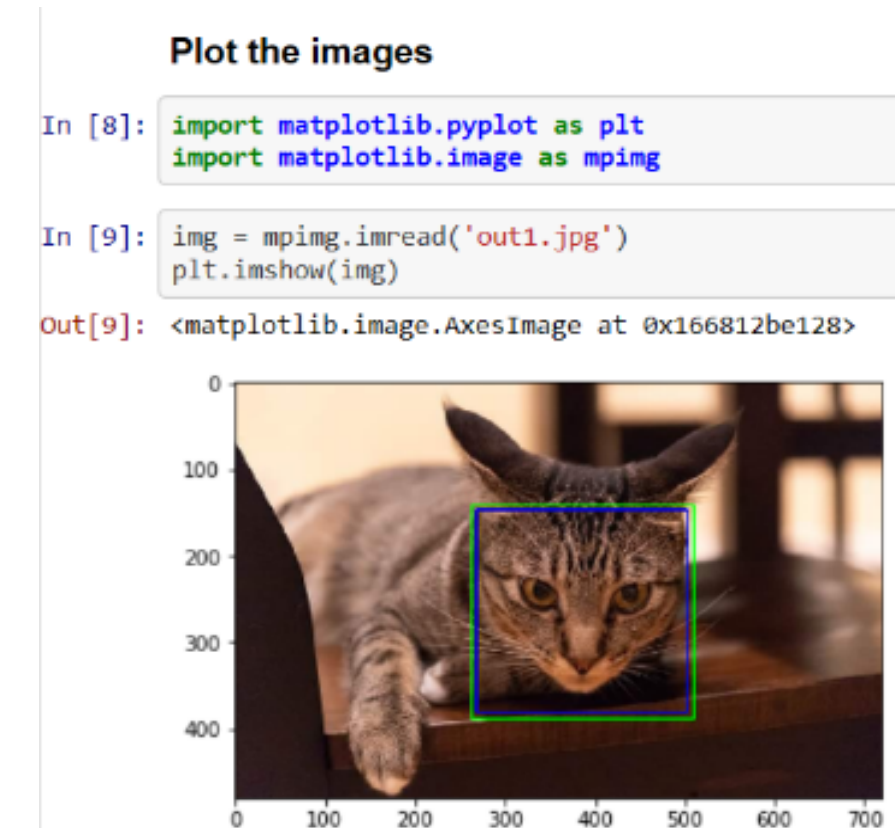
Algorithms work like brains to interpret sensory info

Objects in images are recognised and classified. It's a cat!

How is recognition being used currently?

We commonly see **object recognition** used to analyse the content in images, which is how Pinterest can figure out that four-legged thing is a chair, that it's brown, and because of that you might like interior design. There's also **facial recognition** which can be quite reminiscent of Orwell's 1984 but is currently used for things like auto-tagging faces on Facebook and in building security. And we shouldn't forget **speech recognition** which has changed how we interact with our phones and devices entirely.
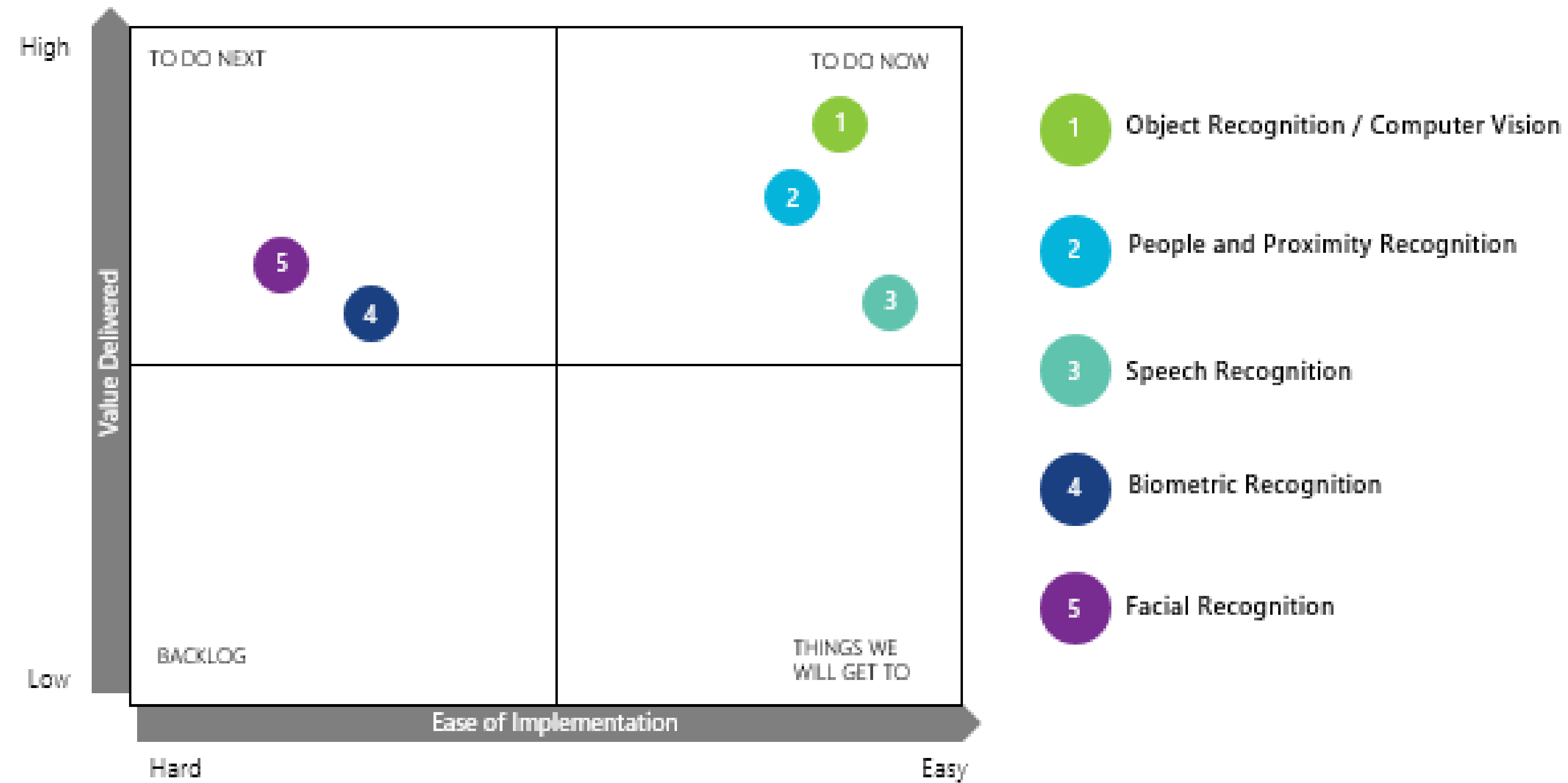
In summary, many of the things (and people) that humans can recognise through sight and sound, so too can machines.

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There are a range of recognition technologies already in play. These include:

High — Value Delivered — Low

TO DO NEXT

TO DO NOW

1
2
5
4
3

BACKLOG

THINGS WE WILL GET TO

Ease of Implementation — Hard — Easy

1 — Object Recognition / Computer Vision

2 — People and Proximity Recognition

3 — Speech Recognition

4 — Biometric Recognition

5 — Facial Recognition

1 **Object recognition** - (otherwise known as computer vision or video analytics) uses photography and video and AI to identify objects. This has already changed the game at CBCity but can be expanded to:

- Identifying illegal or non-compliant activity on a city-wide scale including contaminated waste, illegally parked cars, dumped rubbish, non-compliant development, non-permitted use of Council facility or open space, or graffiti; and
- Remotely inspecting assets and infrastructure on a city-wide scale including road and road infrastructure defects, damaged or overflowing bins, overgrown trees, or in-repair street furniture.

2 **People or proximity recognition** – can use Bluetooth or Wi-Fi beacons to detect where individuals are, and move, within a space. This can support:

- The design of indoor and outdoor spaces based on footfall, movement patterns and positioning; and
- Lower energy usage through dynamically adjusting lighting (indoor & outdoor) and heating based on the number and location of people.
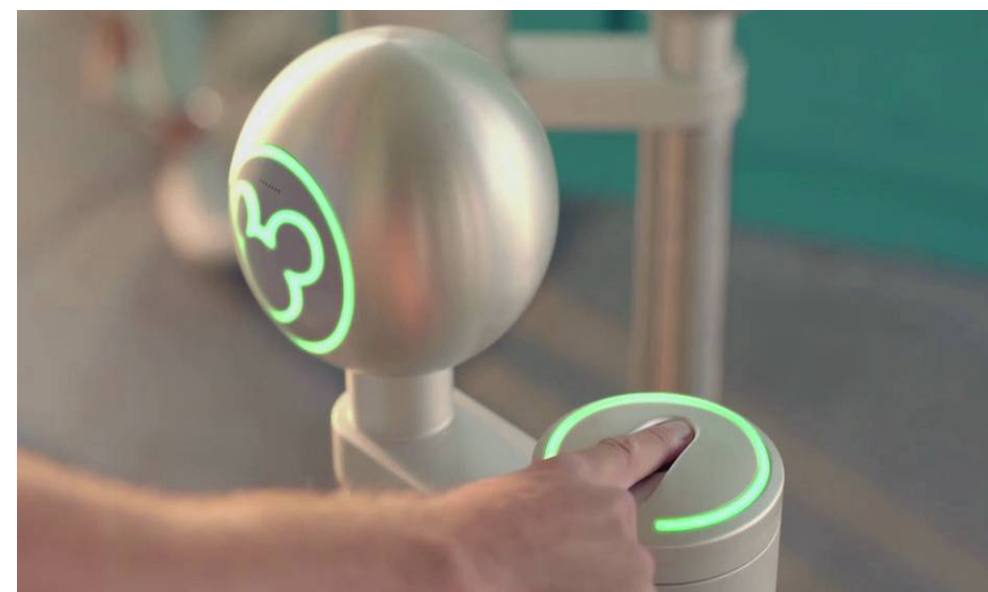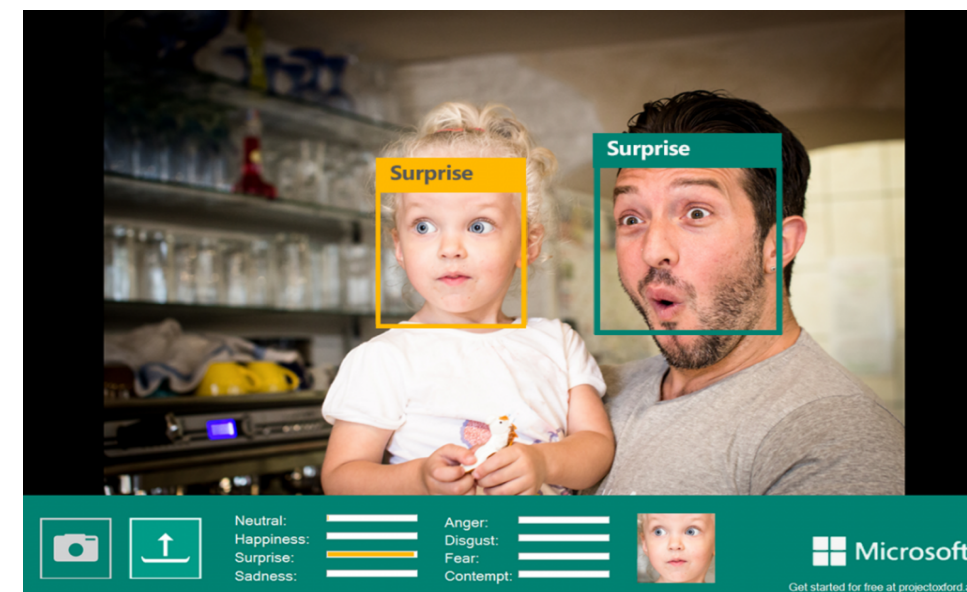
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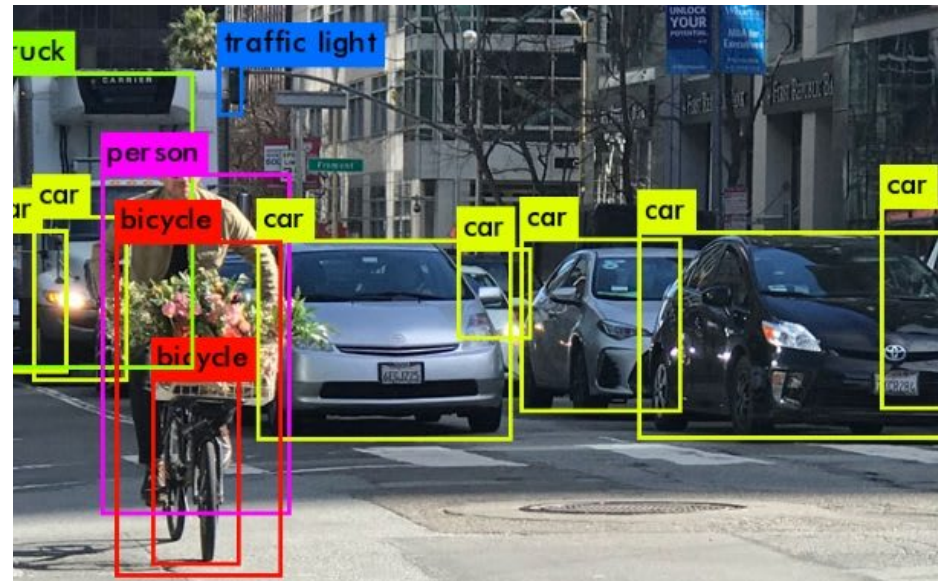
Object detection using street cameras
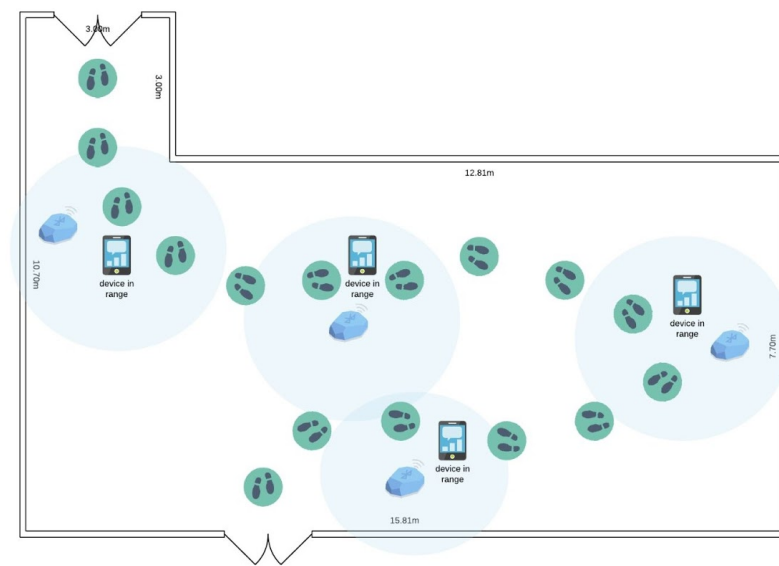
Bluetooth beacons for indoor movements

Speech recognition

Disney World's fingerprint scanning trial

Emotion analysis using facial recognition

3 **Speech recognition** – can be used to improve repetitive and manual processes, from customer service to day-to-day tasks such as:
- Extracting and automatically inputting key call details from customer calls;
- Generating meeting minutes; and
- Translating customer speech in real-time to better cater to our multilingual community.

4 **Biometric recognition** is typically used for authentication and can be implemented for security and access to Council's facilities.

5 **Facial recognition,** though rather intimidating, is already being used on our phones, at airport immigration, and for security and access purposes. In the future, our faces might be the way we pay for things, unlock our cars or access services. Not only that, but facial recognition also doesn't have to store faces and identify individuals, it can be used to identify features like age, gender, or even emotions in visitors.

What does this mean for CBCity?

What should we keep an eye on for the future?

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Digital twins are living, virtual models. These models take in real-time data to reflect exactly what's happening with an asset, product, or environment. This means users get full visibility of how the real-life asset or environment is operating, especially behind the scenes. Digital twins also allows users to play around with future scenarios, enabling learning, experimentation, and dynamic changes for improved decision making (IBM, 2020).

While in government digital twins are commonly associated with spatial planning and urban design, their uses are incredibly expansive. They can exist for almost any process or object, from street sweepers, to traffic networks, to buildings, given there's enough data to do so.

Digital twins for design
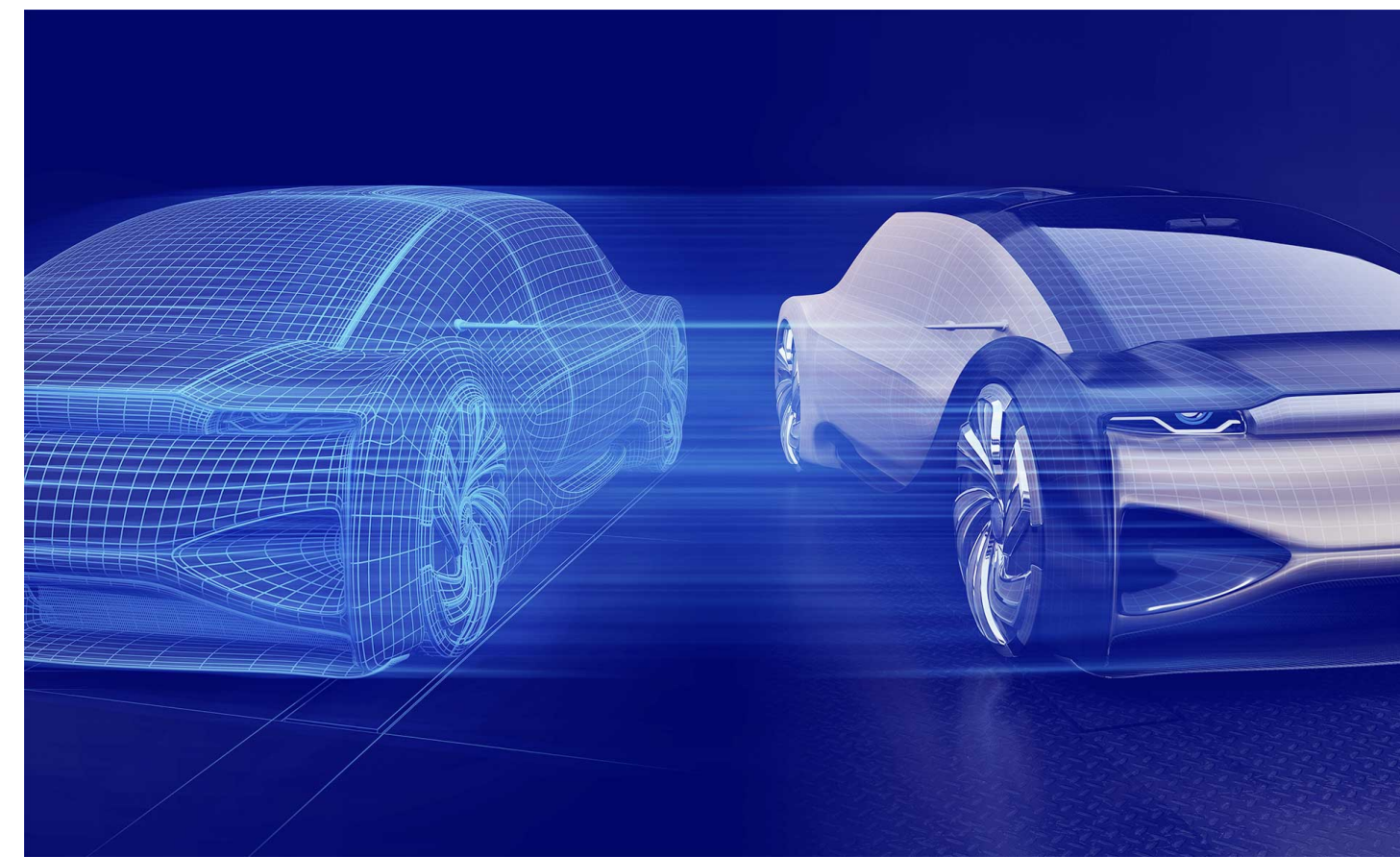
Tesla has a digital twin for every single car it sells for proactive maintenance
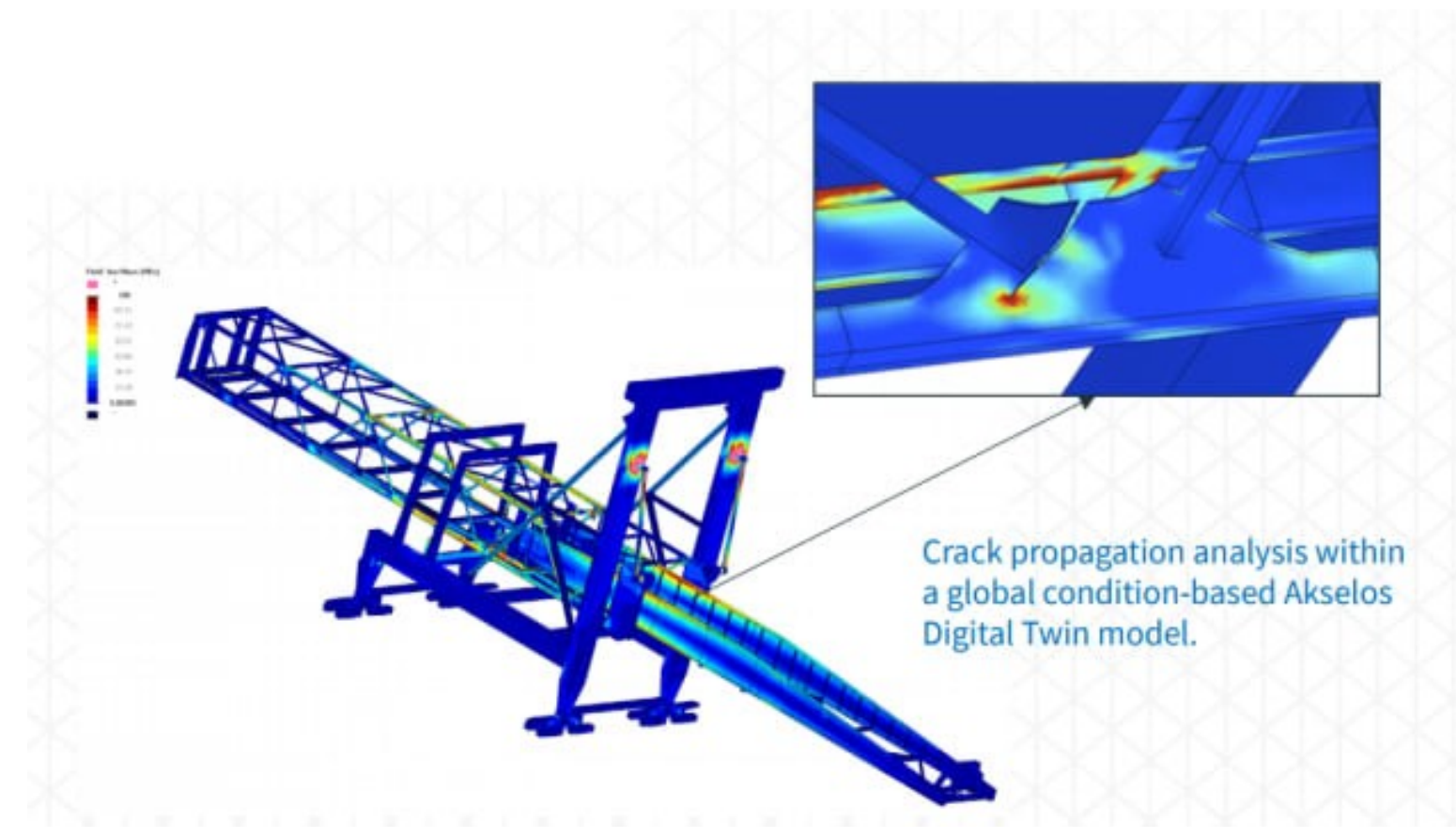
Digital twins can be used to detect stresses and faults in remote assets

How are digital twins being used currently?

Digital twins have their roots in engineering and product design, so fittingly, many of the current uses have to do with assets, infrastructure, and products. Many digital twins are used to assist with the **design of assets and infrastructure**. Twins are built and used to facilitate what-if scenario (simulation) testing - e.g. what is the stress on a bridge if XYZ trucks pass over in a week, or what would happen if we added a roundabout here. Following construction, digital twins are often used for **predictive maintenance and structural health monitoring.** By getting real-time data on the performance of assets like cars, brakes, bridges, wind turbines, or cooling towers, arising issues or faults can be detected and addressed prior to failure.

On a larger scale, digital twins are being used to model the impact of policies, climate change, transport, housing, and disaster management in different **urban planning** scenarios. Digital twins are particularly useful in scenarios like this with many complexities and interconnected systems (like traffic and transport).

Digital twins are already being explored in local government and at CBCity. Some of these use cases look like:
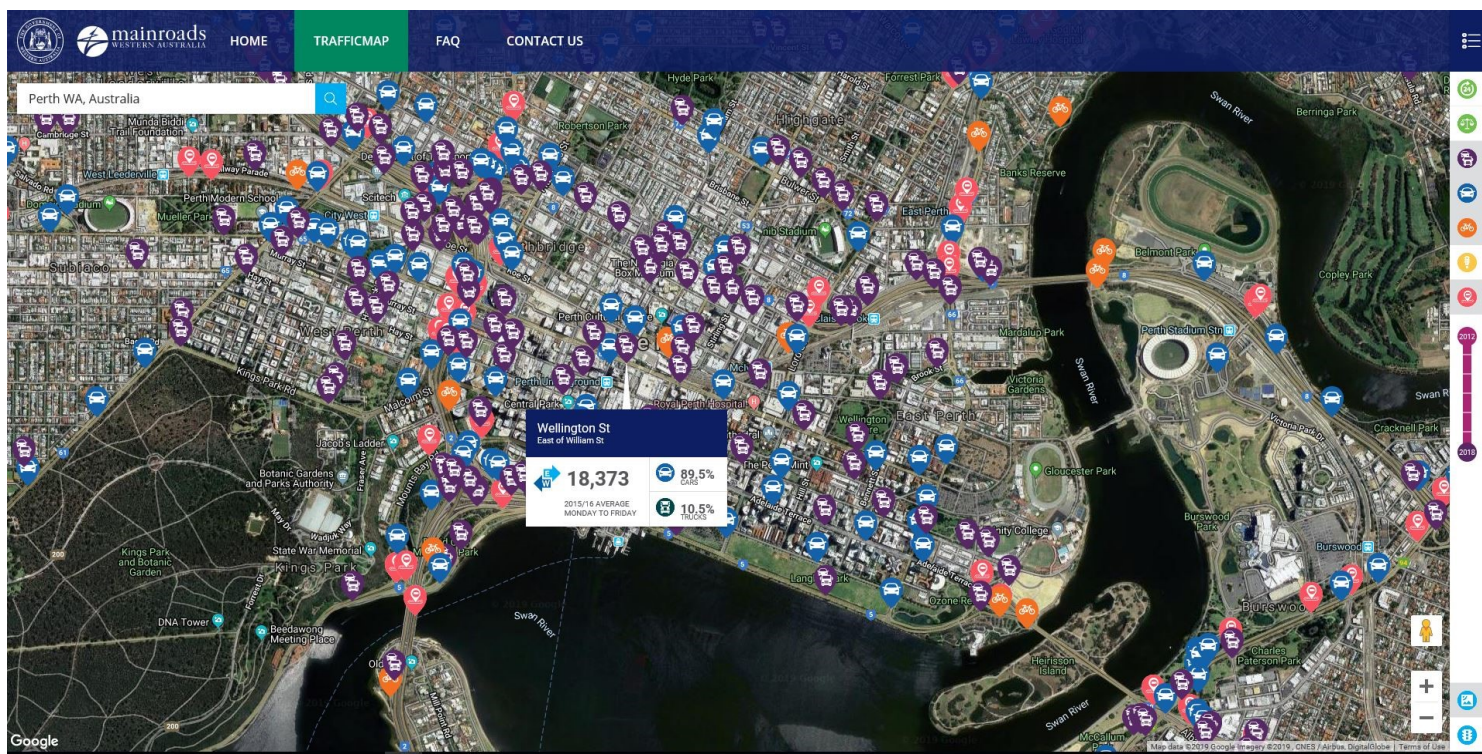
1 **Road and Traffic Network Digital Twin.** Governments are creating close to real-time models of their road conditions (including CBCity). State agencies also have data streaming in to model real-time traffic. Combining the two would allow parties to conduct predictive road maintenance, prioritise defects based on predicted deterioration, and model the outcome of various infrastructure and planning decisions on traffic congestion and our road network. In the future, these twins can make their own decisions in real-time, like turning on road signage to inform of congestion or an accident ahead.

2 **Asset Digital Twins.** So this one's quite broad, but digital twins can really be used for any asset or infrastructure that involves designing, construction, operation and maintenance, the only prerequisite being it needs enough data. If an asset is in operation - let's say a street light, then we can use a digital twin of this light to tell us if it's flickering, dimming, or if it's being tampered with.

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3 **City-Wide Digital Twin.** Unlike standalone models used to predict travel demand, air quality, urban heat effects, and housing prices, digital twins have the ability to combine these sub-systems together. In that way, city-wide digital twins can allow for holistic modelling of the impact of planning proposals or policies across these different domains. Singapore is renowned for having developed a city-wide digital twin, Virtual Singapore, which supports decision-making on everything from physical accessibility, emergency and crisis management, land use, and telecommunication networking. Many other governments such as Amaravati – a city born from a digital twin, Cambridge, Helsinki, and NSW Government have begun their digital twin journey.

4 **Combining Virtual Reality Capabilities with Digital Twins** has the ability to recreate how we – a Council and a citizen – experience our City. Integrated VR with our City-wide digital twin creates immersive experiences for urban designers, city planners, and community members to evaluate proposals.

5 **Facility Digital Twin.** In real-time, facility and public space usage can be monitored remotely. This can enable remote facility management including controlling access to specific areas (e.g. booked or at-capacity rooms, staff only areas), optimising room and pool temperatures, and adjusting lighting.

Western Australia Road & Traffic Network Digital Twin

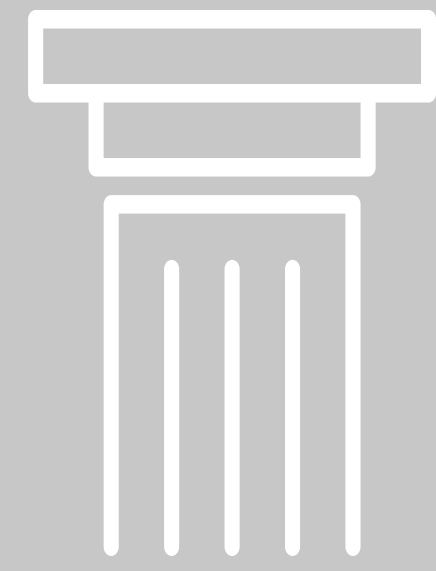Virtual Singapore Digital Twin displaying Solar Generation & Potential
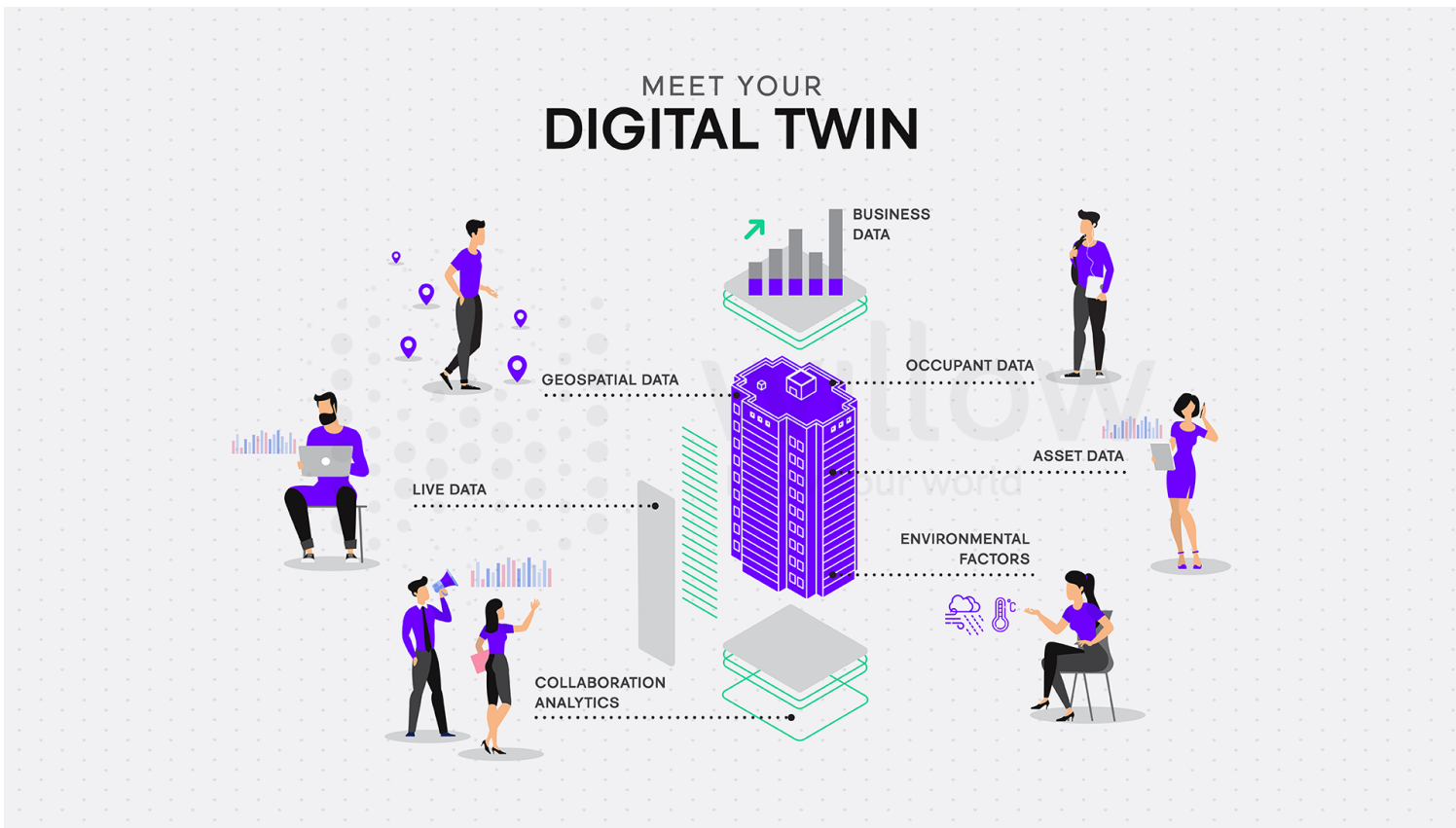
Building Digital Twin with Occupancy, Asset, Environmental Data

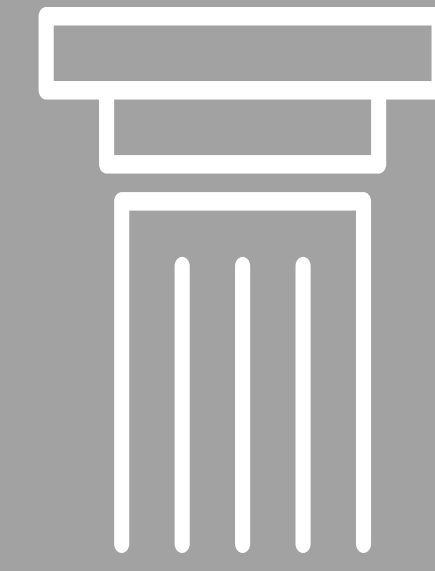MP Dominello viewing NSW Digital Twin using Augmented Reality

What should we keep an eye on?

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Financing Innovation

Cybersecurity

Rethinking how Council finances innovation.

If CBCity is to actively pursue innovation, we need to fund it at the speed of agile (Deloitte, 2020). Traditional procurement and funding models have a fixed, project-based mentality – we predict the future and fix funding accordingly. However, in the age of agile and innovation, this model falls short. Agile methodologies are capacity-funded; a backlog of improvements means outcomes are limited only by capacity. Innovation, more broadly, also requires some risk-taking in order to test and trial new solutions. The experimentation process makes it challenging to quantify an ROI; how do we quantify the value of learning what not to do?

What we need is to reimagine our approaches to innovating and operating at the speed of agile, develop new methods for investing across time horizons, accurately measure the unpredictable long-term value of trialed solutions, and secure creative capital through co-investing across organisations.

Security by design.

In 2020, the Department of Defence, ServiceNSW, WA Department of Health, City of Darwin, multiple universities, and TransportNSW were victims of cyberattacks. An eye-opening case in the US highlights the ramifications of these attacks. In 2018, Atlanta experienced the largest ransomware attack on a US city. Targeted because of its low IT infrastructure investment and huge number of system vulnerabilities, the City was locked out of all systems for 5 days. Police videos were deleted, bills were paid by paper forms, and Atlanta dedicated $2.7 million to recover from the hack.

As we digitise more of our services and collect increasingly sensitive data it is critical we invest in technologies and policies to protect against attacks. Hackers are aware of local governments' lack of formal cybersecurity policies, common under-resourcing of trained and experienced security experts, and poor org-wide staff training on security protocols. As we embark on our data and digital innovation journey, we need a strong cybersecurity foundation to protect our community and Council.
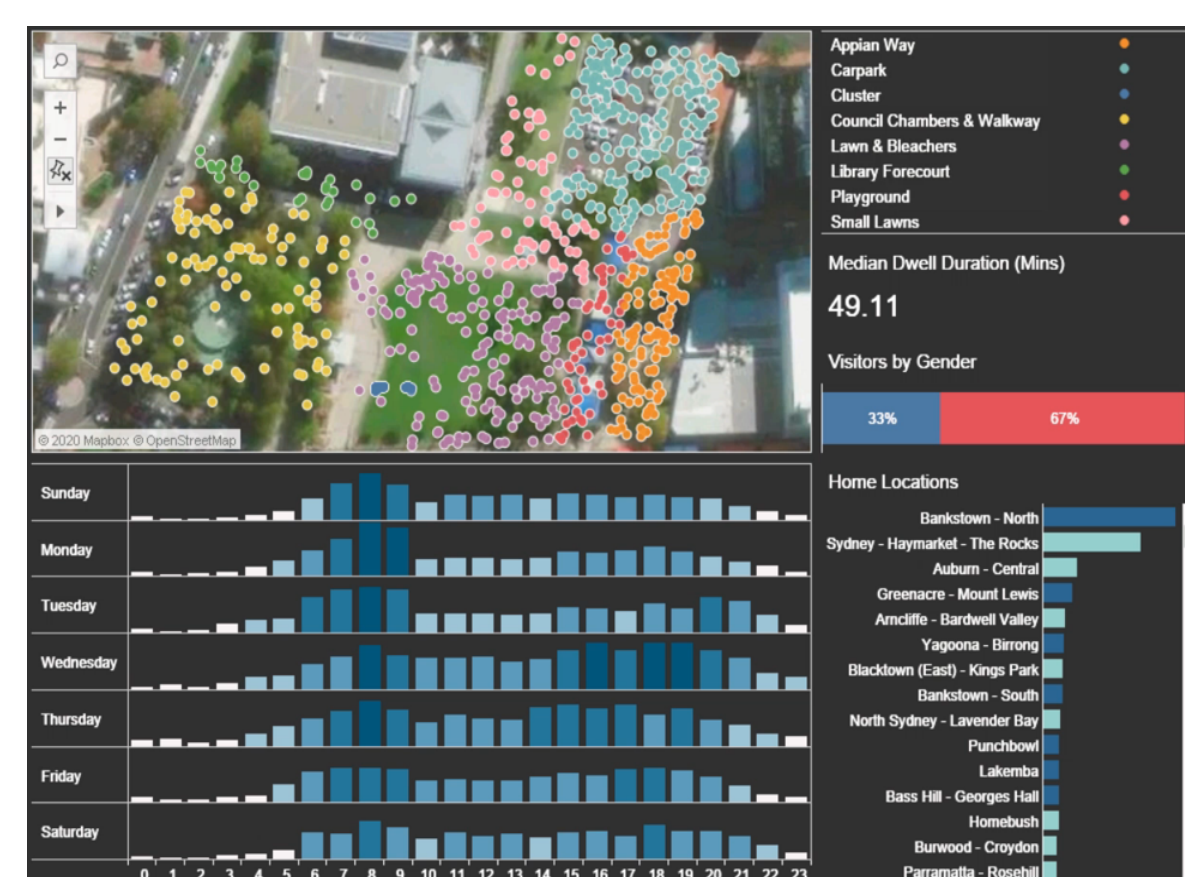
A Case for Innovation at CBCity
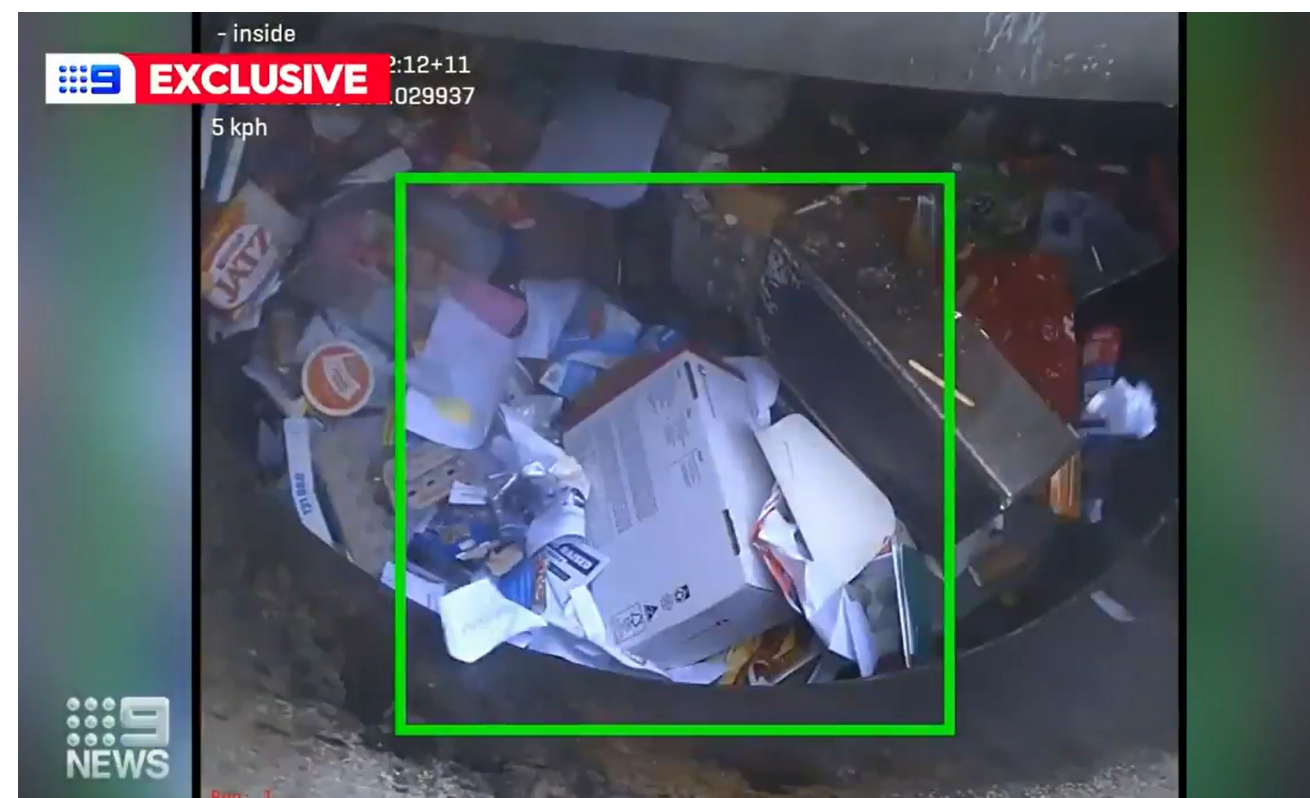
AI used to detect waste contamination
in our bins (Closing the Loop)
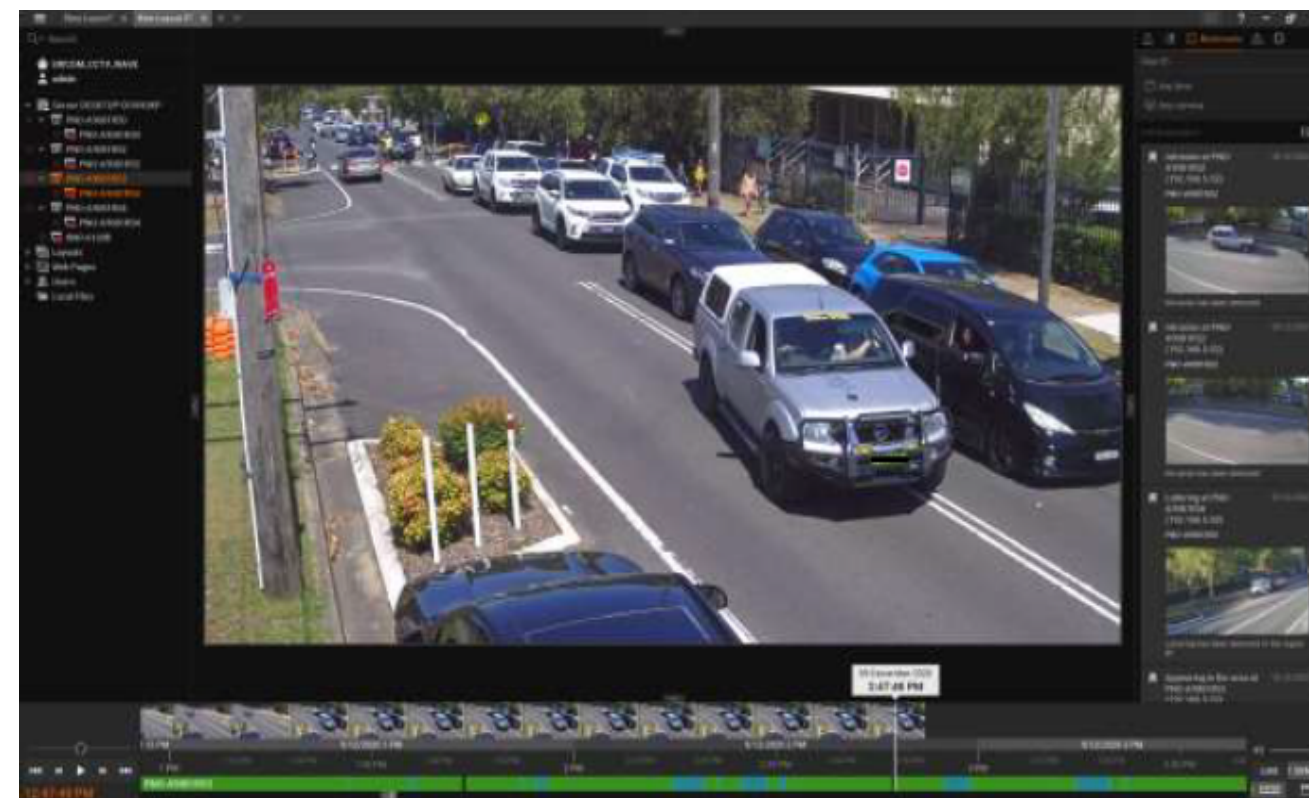
AI used to detect illegally activity
around our schools (SafeTV Schools)

Paul Keating Park Usage Insights
(Urban Flow)

Despite the challenges, CBCity has achieved great things during 2020. We're already exploring a handful of the frontier tech trends highlighted in the report, and we're planning to do a whole lot more.

In a world first, we used Artificial Intelligence in a completely new way, to identify waste contamination in our recycling bins (Closing the Loop). We've started the mammoth task of creating a 3D model to support smart urban design and planning (3D Model). We've trialed the use of computer vision to identify illegal parking in school zones (Safe TV Schools). We used big mobile data to understand park usage and mobility patterns (Urban Flow). And we've begun optimising water and energy use with smart meters.

To the curious minds, we hope this document inspires some innovative ideas and solutions to make our City a better place to live, work, and play. If you need help exploring an idea, reach out to the Smart City team.

"If 2020 has taught us anything it's that, we have the ability to do things better, faster, and smarter with future technology as a core enabler. I know we can carry this momentum and curiosity into 2021 and beyond."

| Mayor Asfour

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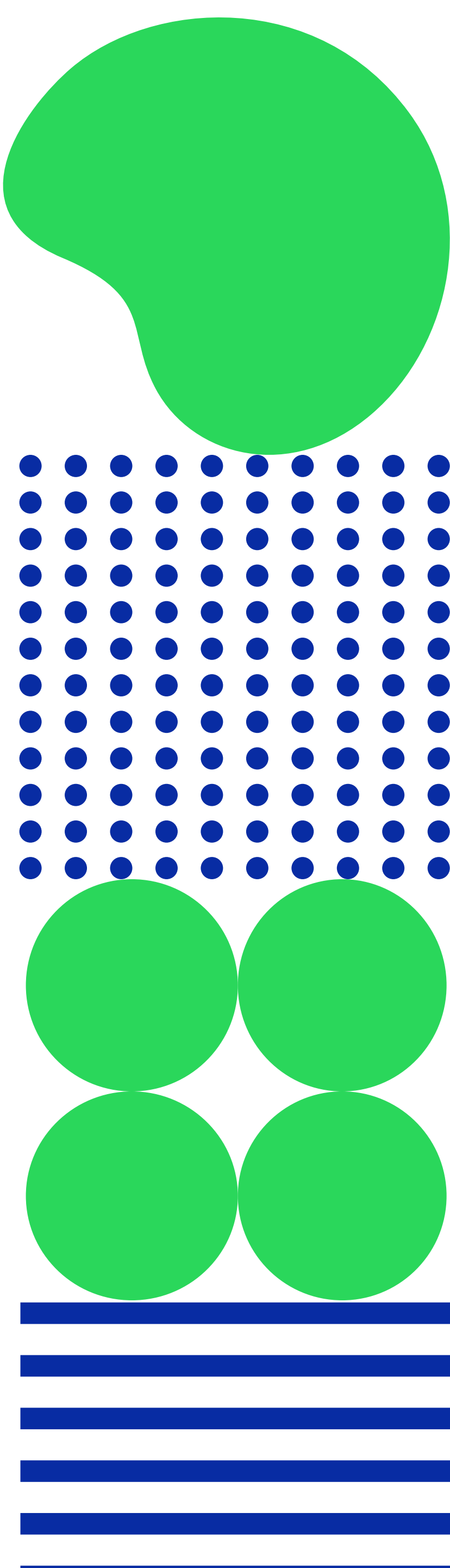
A City Future initiative supporting our mission to dream, design and create the most amazing future for our City.