HERBERT SMITH FREEHILLS

PREPARING AUSTRALIA: CONNECTED AND AUTONOMOUS VEHICLES

Contents

Introduction

Connected and autonomous vehicles (CAVs) are coming to our roads and cities in a future that is no longer far away. They will be one of the more visible transformations of the so-called fourth industrial revolution, in which humans and machines will interact seamlessly in real time with smart devices connected through the Internet of Things.

The technology will not only transform the automotive sector, its application will have broad reaching business opportunities for almost all sectors globally. Society, mobility and transportation as we know it today will be revolutionised.

Delivering a transformation of this scale, however, is not without its challenges, particularly as the technology advances faster than the law can keep up.

On 18 May 2018, Herbert Smith Freehills hosted a conference "Driving forward with connected and autonomous vehicles" in Sydney. This was the final event in a global series hosted in New York, London and across Asia.

Participants included government, infrastructure investors and operators, data analysts, energy providers, insurers and technology investors.

This publication presents the views of panellists as well as experts within the Herbert Smith Freehills CAV team on what Australia needs to consider in order to be ready for CAVs and smart cities.

What governments a

"The advent of
one of

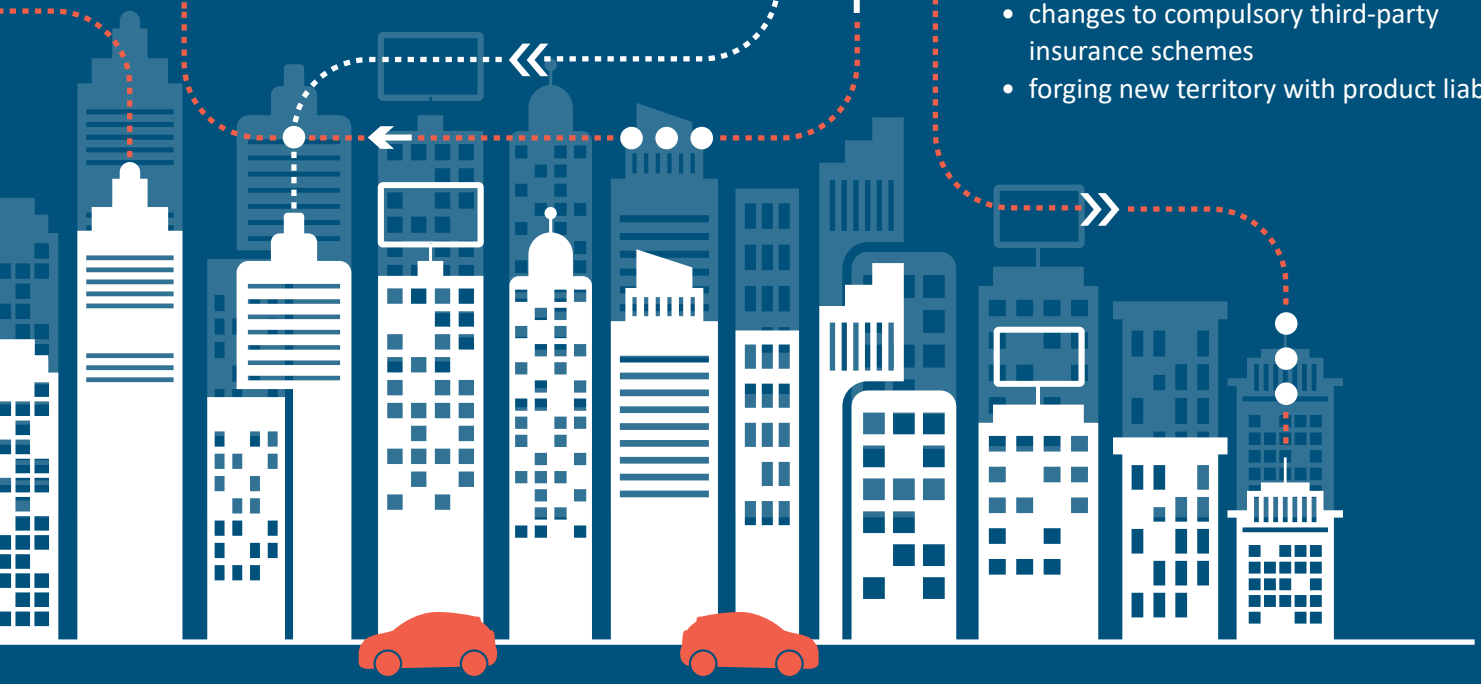
nd businesses need to consider for a CAV future

Smart cities

- the digital infrastructure
- the physical infrastructure
- the electric grid

Balancing risk with opportunity

- data volume, ownership and privacy
- cybersecurity risks
- securing and protecting IP rights
- disruption for insurers
- changes to compulsory third-party insurance schemes
- forging new territory with product liability



connected and autonomous vehicles is without a doubt the greatest changes in the history of mankind."

REW CONSTANCE, NEW SOUTH WALES MINISTER FOR TRANSPORT

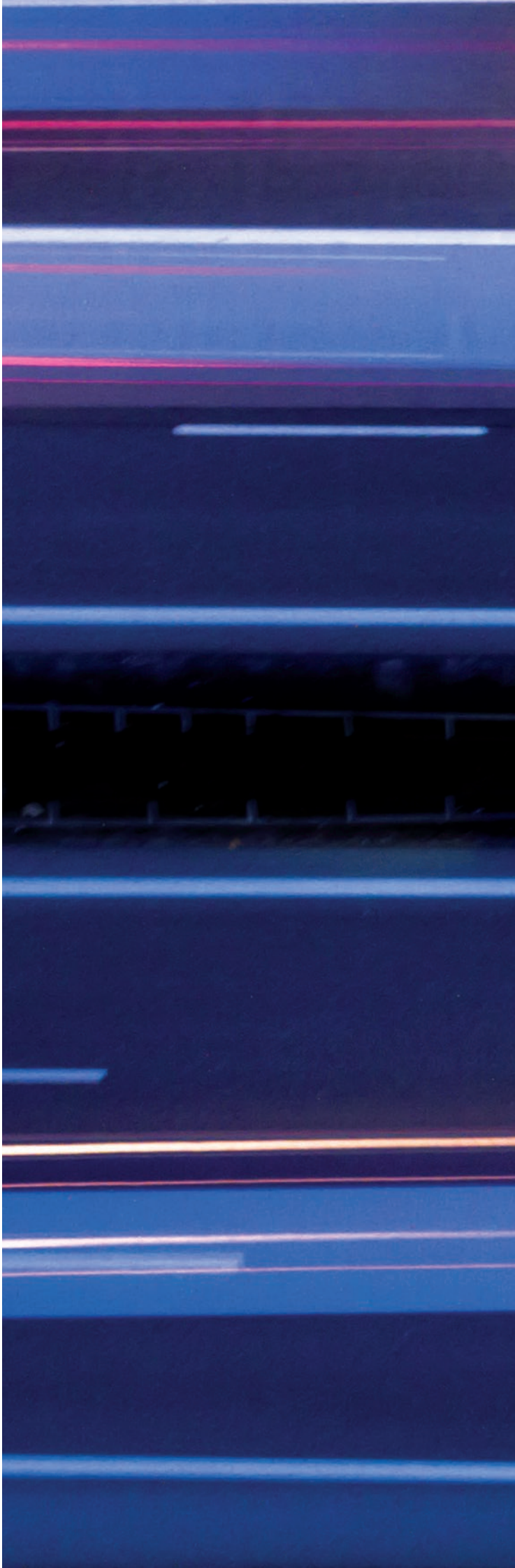
Government

While the private sector is realising the commercial value of a future with CAVs, Australian governments (Commonwealth and State) are grappling with the appropriate role they should play to advance driverless cars.

Existing road rules and regulation will need to be updated. In doing this, governments need to decide on the appropriate regulatory approach. Too much regulation could stifle innovation and uptake; too little could have dire implications for security and safety. To strike the right balance, regulators will need to understand the underlying technology and systems involved. The various governments in Australia must also work together to harmonize our road rules.

In order for Australia to grasp the opportunity offered by CAVs, our governments need to be a catalyst for technology advancement and adoption, not just a facilitator. Without the likes of Google, Uber or Ford being headquartered in Australia, we need to up the ante with funding and incentives to actively attract global CAV players and entrepreneurs to conduct trials in Australia, otherwise we risk falling behind the rest of the world.

This will enable the country to contribute to the development of international standards for CAVs. One of the longer term challenges for government will be reimagining future sources of revenue and developing innovative structures in order to fund the infrastructure required for CAVs and smart cities.



"Transport ministers in Australia have set a national goal of having regulation in place by 2020 to support the commercial introduction of autonomous vehicles."

MARCUS BURKE
PROJECT DIRECTOR, NATIONAL TRANSPORT COMMISSION

Legislating for the future

The National Transport Commission (NTC) has been working with government, industry and the community to establish a regulatory framework for the introduction of CAVs on public roads. As part of a comprehensive program of work, they identified over 716 provisions in transport-related laws and regulations which, unless addressed, could act as barriers to the adoption of road vehicles with high or full automation. In addition, other laws such as privacy, data and work health and safety, will also need to be modernised for CAVs.

The Commonwealth and State governments must work together harmoniously to develop a national approach to legislation that allows for innovation, yet ensures automated vehicles and transport services are safe. They must be proactive to ensure there is no repeat of having to retro-fit legislation to keep up with technology, as was the case when Uber disrupted the taxi sector.

As part of the program, Marcus Burke, Project Director at the NTC, confirmed "transport ministers in Australia have set a national goal of having regulation in place by 2020 to support the commercial introduction of autonomous vehicles".

It involves an overhaul of our road laws introduced in the 1950s and 60s which could not have imagined CAVs. They include requirements for a car to have a steering wheel, a rear view mirror and a driver. The new regulations are expected to be consistent nationally, applicable regardless of the level of automation, and will make way for the integration of international standards as they are developed.

The laws need to be flexible enough to apply as the technology progresses, whilst continuing to ensure safety.

Safety is the priority

In Australia in late 2017, transport ministers agreed on key design elements of a safety assurance system, and a mandatory self-certification approach to safety assurance for automated vehicles. Following on from this agreement, the NTC is exploring a performance model of safety assurance that places the onus on CAV manufacturers. This represents a dramatic departure from our existing safety system, which is highly prescriptive.

The NTC has proposed four legislative options for safety assurance and, following industry consultation, will issue a Regulation Impact Statement (RIS) by the end of 2018 for public consultation. This aims to ensure both public confidence and safety standards for automated features and systems in vehicles on sale in the Australian market.

Public confidence in, and acceptance of, proposed safety measures is particularly important. Anna Wilson, Economist at Frontier Economics, says "a single incident that stays in the minds of the community could significantly delay uptake", and believes that community perceptions will be important in determining what is an acceptable level of safety.

Tony Shepherd, former chair of WestConnex, takes the more optimistic view that people are already increasingly comfortable with machines intervening to save us. "Whether it be ABS, warnings or emergency braking, semi-autonomous vehicles and assisted driving technology is already saving lives."

Steve Bell, Partner at Herbert Smith Freehills, says "over time, we will see a legislative model for safety similar to the model workplace health and safety laws, in which each party with the capacity to control a risk - designers, manufacturers, users - has a duty to ensure that risk is managed to a standard that meets social expectations but is not absolute. Such a duty should include a consideration of what is reasonably practicable and foreseeable and what the party was able to control."

90% of all accidents are caused by human error[1]

1,225 deaths in Australia from car accidents in 2017[2]

$30b the annual cost of road trauma in Australia[3]

Human error is the cause of up to 90% of all accidents. In Australia alone, there were 1,225 deaths on our roads in 2017 and a $30 billion annual cost to society in Australia from road trauma.

So if CAV trials in the US are already showing a 9-fold decrease in accidents, the potential to save a lot of lives and improve quality of life is compelling.

1. Prof Hussein, Dia, 'Self-Driving Vehicles and Shared Mobility: Shaping the Future of Urban Transport' (Paper presented at the ITE ANZ Presentation, 12 September 2017, Swinburne University, Australia), < https://www.ite.org.au/wp-content/uploads/2017/09/ITEANZ-Future-Travel-Hussein-Dia-slides.pdf>.
2. Department of Infrastructure, Regional Development and Cities, National Road Safety Action Plan 2018-2020 (2018) 3.
3. Australasian College of Road Safety, 2017-2018 ACRS Pre-Budget Submission: A proposal for resourcing national road safety to reduce the tragedy of increasing deaths and injuries on our roads (2018) 3.

> **Whether it be ABS, warnings or emergency braking, semi-autonomous vehicles and assisted driving technology is already saving lives.**
>
> TONY SHEPHERD
> FORMER CHAIR OF WESTCONNEX

Understanding CAV technology and systems will be essential for regulators with responsibility for overseeing this area of law, so they can understand the risks that need to be managed and the trade-offs being made by manufacturers in the design and construction of CAVs.

The challenge for government will be to ensure the regulatory system adequately balances industry advice with consumer views, and remains flexible enough to accommodate evolving technologies as they come to market, while prioritising public safety. Susannah Wilkinson, Senior Associate at Herbert Smith Freehills, considers that significant weight should be given to the broader safety benefits of CAVs and the opportunity to remove human error as a contributing factor in road related injuries.

Attracting innovators and encouraging trials

Fundamental to getting autonomous vehicles on the road as quickly and safely as possible, government needs to proactively seek to attract entrepreneurs, technology firms and developers to encourage more trials in Australia.

So what makes Australia an attractive place to run trials? Nicholas Carney, Partner at Herbert Smith Freehills, considers that "the long stretches of highway between major population centres and our high reliance on freight make Australia an attractive place to run driverless truck trials. With 184 people killed in 163 fatal crashes involving heavy trucks across the country in the 12 months to March 2018, trucking could certainly benefit from autonomous technology from a safety perspective. 'Platooning' technology also has the ability to improve efficiency in the trucking sector, particularly in the context of Australia's comparatively high labour costs."

Susannah Wilkinson believes that national logistics could benefit from investment in infrastructure that places greater emphasis on genuine intermodal transport solutions. For example the complete integration of rail and autonomous trucking with dedicated fleet platooning lanes to and from rail depots.

While harmonization must be the ultimate goal, Australia's federated system of government has provided advantages as individual states have been able to move quicker than others to embrace CAV technology by legislating to facilitate trials. In 2016, South Australia was the first state to legislate and declare themselves open for business to CAV technology providers. Victoria and New South Wales (NSW) followed shortly after.

What we don't know yet is which of the many possible commercial models will actually succeed. Accordingly, it's important for public trials to consider and test all forms of automation and transport services.

Carpooling is growing in popularity. Its innovation is in the software, which in turn creates the connectivity and allows people to share a vehicle, whether it be larger modes of transport, taxi services, or First Mile Last Mile (FMLM) transportation.

Niki Scevak, Partner and cofounder of Blackbird Ventures, believes all bets are on the robo-taxi service being the CAV business model most likely to succeed. "Within the next two years you will be able

to go to a major metro city around the world, probably San Francisco, New York, Shanghai or Beijing, and use your phone to hail an autonomous vehicle that transports you without a driver".

In fact, Blackbird Ventures-backed, Silicon Valley-based company Zoox plans to deploy a fleet of fully robotic, electric ride-service vehicles, with no steering wheels or brakes and accelerator pedals, by 2020.

Anne Still, GM Public Policy at RAC WA, however pressed that in order to win the race to 2020, trials needed strong multi-sector private and public partnerships with flex and to fall within state insurance schemes. "It's not easy to run trials so to have government support is critical." And with a strike rate of 98.7% of people who ride on the shuttle, as part of the RAC Intellibus CAV trial, believing it's a viable mode of transport for Perth's future, it's a compelling enough case to advocate for greater government support.

So what is in it for governments? They will need access to the data collected from trials in order to learn and be able to legislate effectively, and so we're likely to see rewards for companies willing to share their intelligence. Andrew Constance also believes "the key to ensuring an attractive environment for trials will be using data effectively to map our cities. We need to get the mapping right." Australia needs to plan for a future in which commercial fleets of autonomous vehicles will be on our roads. It's already two to three years away in Europe and the US.

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>
> NIKI SCEVAK
> PARTNER AND COFOUNDER,
> BLACKBIRD VENTURES

Standards critical to innovation

Intelligence generated from trials will also be essential to developing international standards. As CAVs need to cross international borders seamlessly, having standards in place will allow innovation to flourish.

As Patrick Sands, Partner at Herbert Smith Freehills, notes: "One can imagine the complexities resulting from competing operating systems for CAVs that are not fully compatible with each other. With CAVs, there's a real opportunity, if not a need, to explore standardisation internationally, particularly in relation to technologies that will underpin autonomous decision-making and safety." This will require collaboration between market players and governments across the globe to define an agreed set of core specifications for CAV technology. As with other standardised technologies, companies that make large contributions of intellectual property to the standards may see strong licensing revenue resulting from those contributions as the uptake of CAVs increases.

In time, governments may also need to confront the question of whether important safety technologies should be the subject of compulsory licences, so that the owner of the safety technology may not preserve for itself the exclusive use of it.

Lessons from inquiry into the Uber fatality case study

Australian regulators need to carefully study the reports of the US National Transportation Safety Board into the Uber driverless vehicle which killed a pedestrian pushing a bicycle in March 2018.

Key findings:

1. The AV system detected the pedestrian pushing the bicycle 6 seconds before the crash but could not identify the object.
2. The vehicle realised that emergency braking was needed 1.3 seconds before impact but automatic braking had been disabled to avoid erratic stopping.
3. The vehicle alerted the human driver 1.3 seconds before impact but the driver was looking down at the AV display screen.

What does this mean for regulators?

1. Regulators need to understand how the different aspects of the AV systems interact with each other. For example, if the system can't determine what an object is, then either the emergency brakes should be activated or the driver should be notified at that time.
2. Regulators need to better understand the trade-offs being made. For example, the decision to disable emergency braking to avoid erratic stopping relies on the human driver to manually apply the brakes, but they need sufficient warning to do this.
3. Design flaws need to be prevented - the AV system screen was positioned so that the human driver was looking down, rather than at the road, when the pedestrian came into view. This meant precious seconds were lost as the driver looked up to see the cyclist before applying the brakes.

Reimagining revenue sources

With the imminent arrival of autonomous vehicles, governments are going to have to rethink how they collect tax into the future. Will this provide opportunities or challenges?

Currently cars are a top tax grab for governments. There is a 5% import tariff on new cars, a 33% luxury car tax on the value of a car over $65,000, 10% GST and, to top it off, a 3% state duties tax. And then there are taxes on fuel, licensing and registration.

The two important transformations that are forcing treasuries to plan for alternative revenue sources are the transition to electric cars and the likelihood that people will no longer own their own vehicles.

Niki Scevak supports this idea that CAVs will not be privately owned. "If you think about robo-taxis as halving the cost of transport, or more, at some point down the cost curve it becomes financially irrational to own a car, and I think that's one of the biggest business markets of our time."

There are two schools of thought as to whether this transformation will lead to savings for governments, or require the same, if not more, capital. Some argue that governments will save billions on infrastructure, parking and motorway enhancements that will no longer be required. However, roads will need to be upgraded and maintained to allow vehicles to perform properly, thus requiring significant spend. Inner city roads will also need to be modified to account for an increased level of drop off/pickup zones and scooter/bike lanes for FMLM trips.

How will governments continue to pay for road modifications and maintenance and public transport services? State and local governments will likely look to the companies offering self-driving systems to help foot the bill.

Some US states have proposed a 'vehicle miles travelled tax'. For example, Tennessee has legislated a 1 cent per mile tax on self driving cars and a 2.6 cent per mile tax on self driving trucks with more than two axles. In addition, cities are likely to introduce congestion taxes for those entering the CBD. Australia will also need to consider alternate funding models such as user pays systems based on distances travelled.

> **Given governments face funding issues, we may see a shift to self-funding transport services like in London, Singapore and Hong Kong.**
>
> STEPHEN MCDONALD
> GENERAL MANAGER STRATEGY, TRANSURBAN

In relation to public transport, Stephen McDonald, GM of Strategy at Transurban, says "given governments face funding issues, we may see a shift to self-funding transport services like in London, Singapore and Hong Kong."

For the private sector, companies with an eye to the future must consider how their business will change and what the best commercial opportunities could be. Collaboration between public and private entities will enable innovative infrastructure and services to meet the changing needs of people. And this is just the tip of the iceberg. For consumers, mass savings from car ownership and fuel, not to mention a rise in productivity will be some of the benefits of not owning a car.

Revenue streams impacting government

Federal Government

- Loss of luxury car tax, fuel excise tax and fringe benefits tax

State Governments

- Loss of GST on car purchases, fuel and maintenance
- Loss of diver's licence fees, car registration fees and speeding fines

Local Governments

- Loss of parking fee revenue (partially offset by fewer parking inspectors)

DRIVING FORWARD

- Regulators must understand the technology that's coming in order to regulate effectively, however, any regulation must be technologically agnostic to provide flexibility to adapt to a rapidly changing and uncertain future.
- Road regulations need to be flexible enough to apply as the technology progresses, whilst continuing to ensure safety.
- Australia should be involved in discussions regarding international standardisation of CAV technology.
- Governments need to encourage trials quickly to gather data and feed back into product development.

Smart cities

CAVs will radically transform the way society functions. To realise their full potential, our cities must adapt to the new requirements and become smart metropolises.

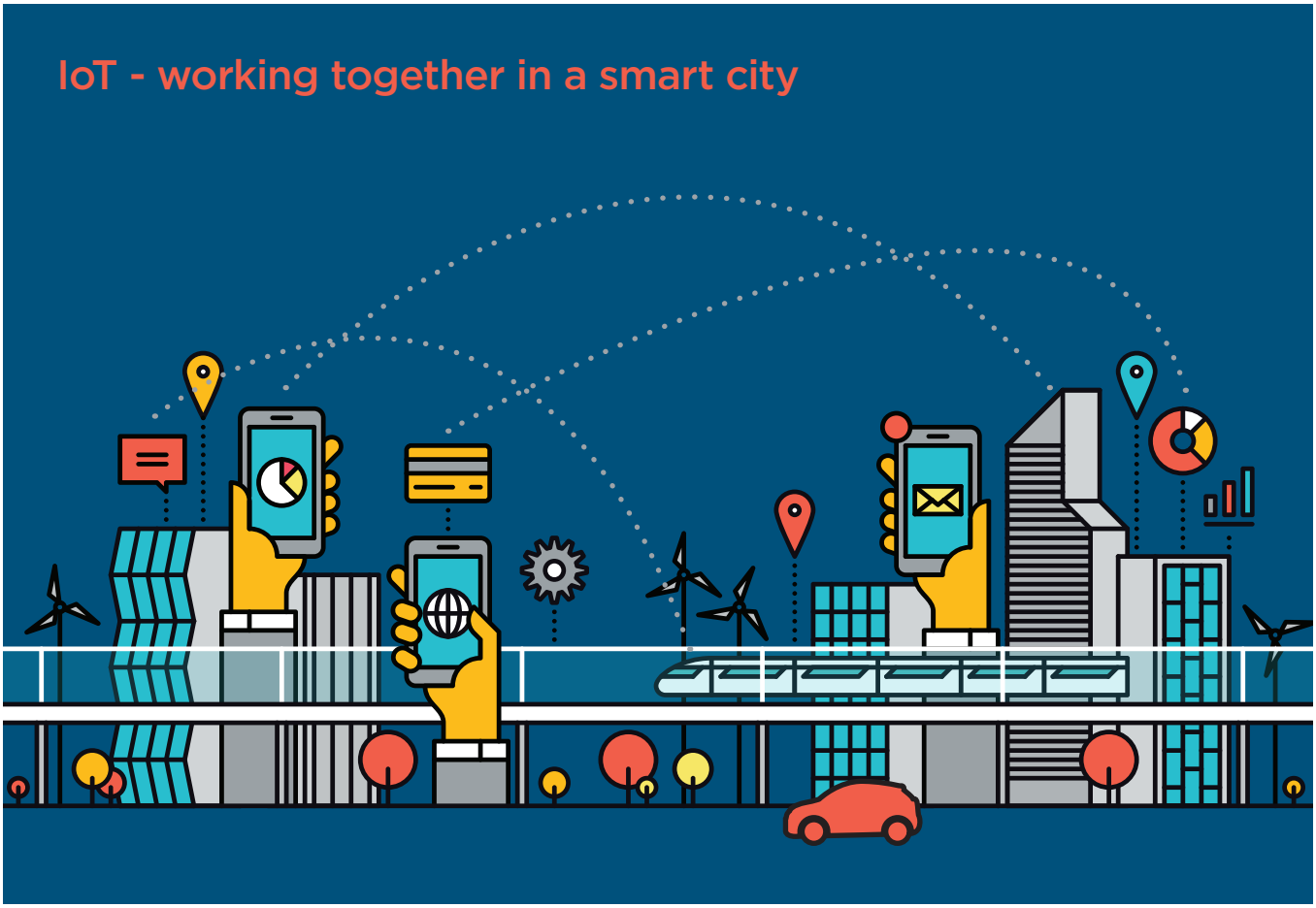
The Internet of Things (IoT) will be key to their operation, allowing for an interoperable and deeply connected network where devices, vehicles and buildings continuously learn from each other.

With smart cities promising improved quality of life, sustainability, public health, and efficiencies in managing resources, transportation, security and other services, the societal and economic benefits are huge.

To facilitate the adoption of CAVs, it's necessary to consider the elements of a smart city and how driverless technology will influence change.

"From our point of view, the number one return on investment for smart cities will be transportation. If we're going to make a real difference in cities and show ROI, we need to solve congestion, and I don't mean rebuilding roads and adding more lanes. We need to put smart infrastructure in place."

KEVIN BLOCH
CHIEF TECHNOLOGY OFFICER, CISCO



The digital infrastructure

We are accustomed to thinking of infrastructure in physical terms but smart cities will rely as much on digital infrastructure as our cities currently do on traditional road and rail networks. They will utilise technologies to sense, collect and measure data to help us make better decisions about the way we live (augmented intelligence) and will require elements of our physical world to be digitised and connected via the IoT.

With two-thirds of the world's population expected to live in cities by 2050 (according to the United Nations)[1], increasing urbanisation and the subsequent adverse effect on traffic congestion are driving the need to start planning for smart cities now.

Kevin Bloch, Chief Technology Officer at Cisco, agrees. "From our point of view, the number one return on investment for smart cities will be transportation. If we're going to make a real difference in cities and show ROI, we need to solve congestion, and I don't mean rebuilding roads and adding more lanes. We need to put smart infrastructure in place. "

The Australian government has put a price tag of $2 billion per year on the social and economic costs of traffic congestion in a city like Sydney. Addressing the enormous waste of resources currently spent on commuting and traffic snarls will be a key benefit of an intelligent transport system (ITS).

It's not all utopia though. Andrew Constance says "an important challenge we're grappling with is how to develop one single operating system to manage the entire transport network so that everything is connected, responsive and runs seamlessly."

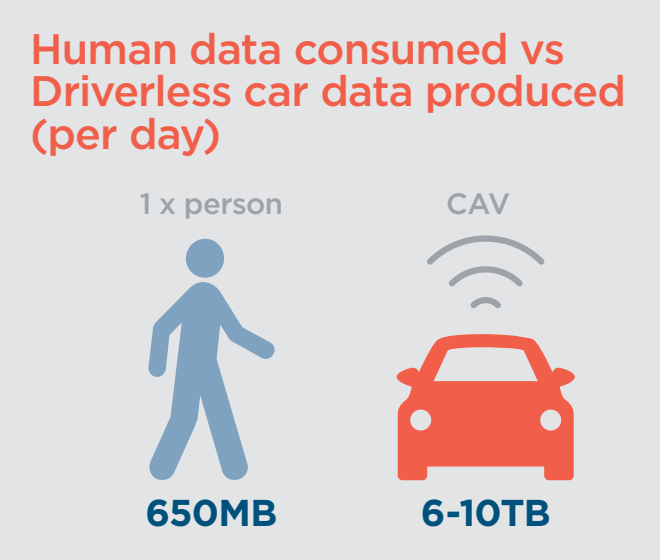
A future transport system will need to rely on a digital platform to integrate end-to-end trip planning, booking, and payment services across all modes of transport, both public and private. Known as "mobility as a service" (MaaS), individuals will pay a fee to transport themselves around cities using a range of solutions including ride sharing, FMLM (which transports people to and from public transit hubs) and robo-taxis. While autonomous vehicles are still years from being ready to run on a mass scale, having fleets of vehicles in which we purchase our mobility as a service will create the greatest change and societal benefits.

1 https://www.un.org/development/desa/publications/2018-revision-of-world-urbanization-prospects.html

Big cities, big data

Smart cities will run on data and rely on machines to aid in decision making. Given its centrality to economic growth and efficiency, open data must be granted the same importance as transport and energy networks. Damien Bailey, Partner at Herbert Smith Freehills, described the exponential increase in data in a smart city. "CAVs alone have the potential to produce up to 715 megabytes of data per second, amounting to 6 to 10 terabytes per day. If the average person consumes only 650 megabytes of data a day, the enormous amounts of data that will flow from this will be phenomenal."

Given the amount of data involved, cities will face issues relating to data ownership and access, privacy, security, storage and commercialisation. What network infrastructure do we need in place to manage and store the vast amounts of data and who will run them? This will require a collaborative approach between connectivity providers and infrastructure companies to own and operate data centres and cloud solutions, particularly given the significant cost involved.

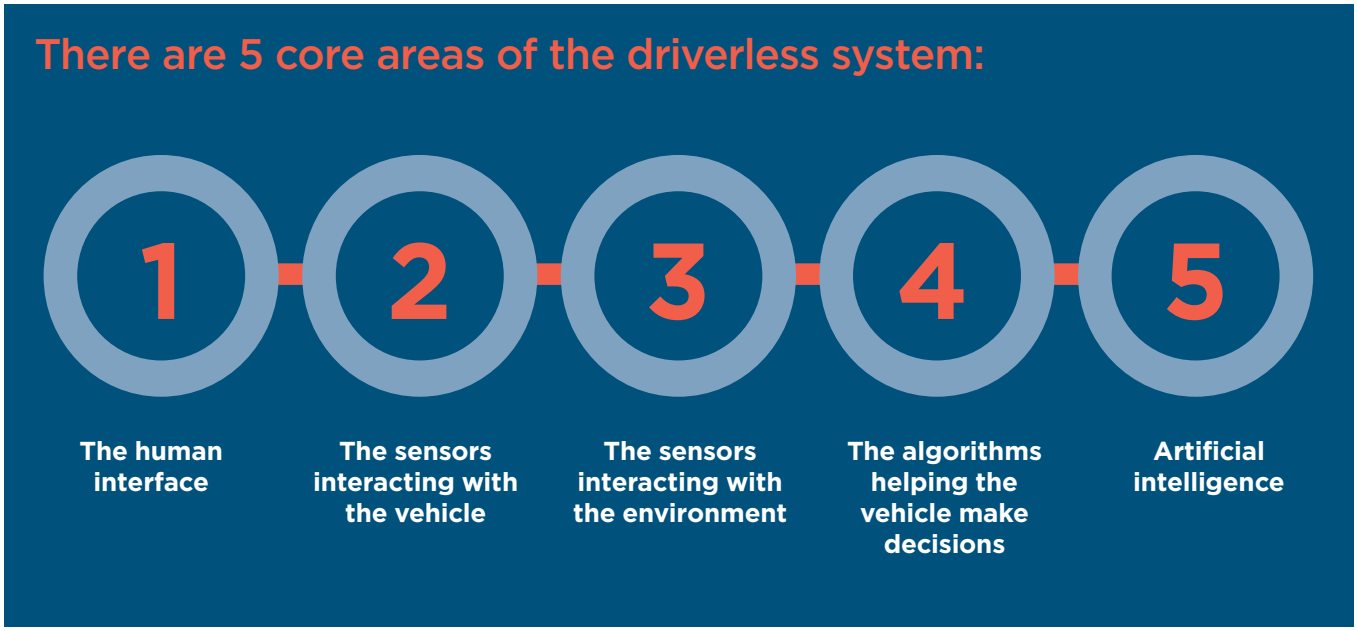


Questions of connectivity

5G is set to arrive in many countries by 2020, with 6G expected by around 2040. The instantaneous and reliable mobile internet connection that 5G will offer is expected to be up to one thousand times faster than 4G and will be key for the transformation to smart cities and an integrated operating system for transport.

What is not yet known is whether connectivity providers and 5G networks will be critical for the operation of CAVs. Stephen McDonald says "there are no clear guidelines in place for communication protocols and so manufacturers are competing with trials that use different radio technologies including DSRC (Dedicated Short Range Communications)". DSRC is a sensor that is placed on the vehicle to enable the collection of data from its surroundings so it can make decisions within a limited range – it is the artificial intelligence of the vehicle.

It's likely we will see a combination of wireless networks used to operate CAVs. DSRC operates via a wireless spectrum band (5.9 GHz) and will manage the low-latency systems like collision avoidance, which will be handled by V2V (vehicle-to-vehicle) sensors. Slightly longer range systems, impacting congestion and road signals, will leverage 5G.



The physical infrastructure

With stakeholders largely in agreement about the inefficiency of roads and the economic costs of traffic congestion, the wasted capital of transport infrastructure, carparks, vehicles and fuel, the challenge is how best to transition to a partially and then fully autonomous transportation system.

Andrew Constance described a future transport network that will dramatically remake the built environment and change the way people think and move around cities, making timetables a thing of the past. "You will walk out your front door, there will be a pod to transport you to a metro station or a train station where you will be collected by a fully autonomous train, which has the capacity to turn up every two minutes."

Unlocking value in existing infrastructure

Existing infrastructure will undergo significant reconfiguration. Professor Alan Berger from Massachusetts Institute of Technology has predicted that autonomous vehicles could allow paved surfaces in our cities to be reduced by up to 50%. That space could be used instead for additional housing, parks or other recreational areas.

Niki Scevak spoke about using smart urban planning to unlock the wasted infrastructure we already have. "The two outer lanes of roads being used to park cars: what if, at some point in the adoption curve of autonomous vehicles, you didn't allow any car to be parked, you essentially double that road laneway availability for cars to pass. Obviously if you reach a world with fully autonomous vehicles, they can all drive within 2cm of each other and the yield of toll roads can skyrocket."

> **You will book your transport via mobile. You will walk out your front door, there will be a pod to transport you to a metro station or a train station where you will be collected by a fully autonomous train, which has the capacity to turn up every two minutes.**
>
> ANDREW CONSTANCE,
> NSW MINISTER, TRANSPORT AND INFRASTRUCTURE

Anne Still commented that most of the problems that the RAC Intellibus encountered on existing roads were external to the vehicle, and 90% of those were related to badly parked cars. While the shuttle is programmed to go within five centimetres of a parked car, people are less precise about parking between the lines. "So having a situation where we wouldn't have parked cars on a roadway, I can tell you now that it removes half the problems we have encountered."

A changing workforce

According to a 2018 report from the Centre for Future Work, the transport industry employs 625,000 people - many of them older males without formal qualifications - who earn $45 billion in wages and pay $25 billion in taxes. The report predicted that technology, first in terms of technology-enabled platforms for Uber-style contracting, and then by automation, will radically reshape the industry.

The introduction of CAVs will result in a critical skills shortage across a range of industries, as low-skill roles progressively become redundant. Any employer seeking to increase efficiency and reduce the human costs of doing business will feel the effects of the gap between supply of technically skilled workers and the demand for them. For example, data analysts are enjoying higher salaries today compared to just two years ago. To address the systemic skills gap, some large companies are finding alternate supplies of labour through focused retraining or targeted recruitment. For example, establishment of programs for upskilling military veterans or recruitment programs for cyber security and data analysts focused on those on the autism spectrum.

Australia has one of the most highly regulated labour markets in the world, and the labour law framework has been the subject of criticism over the years from foreign investors for its complexity, high wages and, at times, instability. It is shaping up to again become an issue in the next Federal election. While perhaps less urgent to CAV trials and technology development than other regulatory reform - driving, insurance, taxation - the current workplace relations framework does have short and long-term implications for the composition and management of the Australian workforce and in its current form, will undoubtedly impact the speed of introduction of CAVs into businesses. The Transport Workers Union has already indicated that it will challenge driverless and automated transport trials and rollouts across Australia. By way of example, the OPAL transport card in NSW took almost ten years to introduce due to union resistance, demonstrating the ability of unions to influence the delivery timing of major technology projects. As such, it is imperative that businesses consider, as part of their initial strategy to introduce CAVs into their operations, their obligations under Australia's workplace relations framework.

Penny Brooke, Senior Associate at Herbert Smith Freehills says, "as companies grapple with the change from old workforce to new, it is essential that they consult properly with employees and unions as they undergo workplace transformation."

Productivity is also set to surge alongside flexibility. With fleets of CAVs transporting commuters, trips to and from work will be quicker, easier, and more productive than everybody having a car and driving to work. But such transformation won't be without labour pains; Andrew Constance highlighted the changing nature of the future transport workforce, pointing to political challenges that governments will face in adapting to a smart transportation system.

In a world of declining public revenue from individual car travel, governments will need to maximise the efficiency and lifetime of their existing infrastructure. One way to do that is to increase capacity on existing roads with features like traffic harmonisation using connected vehicles; and platooning, in which CAVs will talk to each other through V2V technology, following a lead vehicle that sets the speed. Current trials in the US are looking at whether putting a few automated vehicles in regular traffic improves flow.

Another path to efficiency, as Transurban's Stephen McDonald suggested, would be to "shift automated heavy vehicles to nighttime travel and off suburban roads". The better allocation of vehicles and assets will increase productivity and consumer safety.

Flexible design for the future

Savvy real estate developers and urban designers are already factoring in smart city transportation into new building projects. Nicholas Carney noted that, major real estate investment trusts (REITs) have been building their car parking spaces in the same configuration as their retail spaces for some time now, planning flexibility if and when there is less demand from parking.

Industry participants considering investing in new infrastructure under long-term contracts should build in flexibility to manage the advent of CAVs. Susannah Wilkinson confirmed, "I think the absolute key will be flexibility in how we design our spaces— for the next few years you may still use underground carparks but going forward we should consider designs that provide car spaces based on more flexible designs, possibly above ground, that can easily be converted for a different use in the future when demand for carparks diminish."

Urban planners and architects will also need to think about using those spaces in different ways, such as for EV charging stations or hubs for shared vehicles. We are already seeing innovative examples of redundant underground carparks being repurposed into hydroponic gardens like Growing Underground in Clapham, London.

Standards critical for smart infrastructure investment

Intelligent transport systems will rely on internationally agreed standards governing V2V and vehicle to infrastructure (V2I) technology.

Nicolas Hohn, Senior Analytics Expert at McKinsey and Chief Data Scientist at Quantum Black, confirmed the importance of building international standards for explainable artificial or augmented intelligence models. "You don't want to get into a situation where some black box in your car is making life or death decisions without anyone understanding why the algorithm is making that decision".

> **You don't want to get into a situation where some black box in your car is making life or death decisions without anyone understanding why the algorithm is making that decision.**
>
> NICOLAS HOHN
> SENIOR ANALYTICS EXPERT, MCKINSEY AND
> CHIEF DATA SCIENTIST, QUANTUM BLACK

Outside of the connected vehicles will be a world of V2I devices such as smart traffic signals, which communicate with the vehicle but are external to it. Agreed standards for infrastructure are critical to technology development and commercial exploitation of IP rights, not to mention consumer confidence.

Patrick Sands says there is an enormous commercial opportunity awaiting those who are leading the innovation charge in relation to CAVs because those leaders will likely influence the drafting of international technology standards and reap the resulting commercial benefits.

The electric grid

Before we see the advent of CAVs, we will increasingly see electric vehicles (EV) on our roads. The Australian Bureau of Statistics reported a 159.2% increase in the number of electric vehicles registered in the country to 8,334 between 2013 and 2018.[2] Once EVs become AVs (autonomous vehicles), and cities are powered by an increasingly renewable electric grid, how will we ensure sufficient energy supply? And who will be responsible for the infrastructure?

While the energy to fully charge an electric vehicle battery (~20-24 kWh) may be more than the average daily household electricity usage in Australia (~15-20kWh)[3], the benefits stack up in favour of a shift to EVs:

- **Cheaper** – according to Canstar, the electricity to charge an EV is approximately one-third that of petrol per kilometer[4]
- **Lighter** – without the large combustion engine, EVs are significantly lighter and so are more energy efficient which will provide economic incentives for adoption
- **Less pollution** - with no exhaust emissions, EVs reduce air pollution in cities and lead to improved public health outcomes
- **Renewable energy** – by using renewable energy to recharge an EV, greenhouse gas emissions can be reduced

2 https://www.cleanenergycouncil.org.au/policy-advocacy/reports/power-shift.html)
3 https://www.ausgrid.com.au/-/media/Files/About-Us/Sharing-Information/Ausgrid-average-electricity-consumption-by-LGA-201617.pdf
4 https://www.canstarblue.com.au/electricity/much-can-electric-cars-save)

How much does it cost to recharge an EV?

ELECTRIC **VS** FUEL

Electricity costs $0.25 per kilowatt hour
Takes 18 kWh to travel 100kms
Cost **$4.50**

Petrol costs approx $1.50 per litre
Takes 11.1L to travel 100kms
Cost **$16.65**

Source: http://myelectriccar.com.au/faq

Charging EVs

Currently there's very little charging infrastructure in Australia. Linda Koschier, Head of Partnerships, Future Energy and Business Development at Origin Energy, confirmed electricity providers are working out what their role needs to be and what the charging requirements will look like. "How do we as energy providers play in this space – will we provide the charging infrastructure, as in the hardware, or are we just selling the electrons? And where will people be charging their cars; at home, work or along the freeway? How fast does charging need to be?"

In addition to plug-in and battery-charging models that are already a commercial reality for EVs, several Australian jurisdictions are trialing induction charging, which doesn't require drivers to plug in the EV but instead places charging loops along the road to recharge cars on the go. The RAC Intellibus trial in Western Australia used this induction method of charging.

The future charging landscape for EVs will rely heavily on stored energy. This will become a critical element in balancing supply and demand during peak times and emergencies such as power outages or natural disasters. Batteries are the most common form of chemical storage, but other forms include air compression, hydro-electric pumping, and dry ice. Energy storage systems currently contribute approximately 2% of generation capacity in the US[5] and, with similar levels of uptake in Australia, battery storage in particular presents an enormous opportunity for businesses to help manage reliability of their energy supply.

Linda Koschier supported the importance of renewable energy and imagined a future where EVs "could potentially be a source for energy themselves". She believes the way of the future is "to have a total automated energy management home system whereby an energy provider could control loads and switch them at different times so the community can benefit as a whole".

The deployment of charging infrastructure and the increased demand for energy both require significant investment. So in order to power smart cities, EVs and CAVs, the private sector and governments will need to consider hybrid funding and collaborative investment models. Furthermore, within Australia opportunities will extend to those with innovations in energy storage technologies and renewable energy sources.

5 http://energystorage.org/energy-storage/faq

Best opportunities for Australian companies?

So where do the opportunities lie for Australian government and the private sector in the evolution of smart cities?

- The anticipated surge in demand for electricity that will accompany the widespread rollout of EV technology will drive further investment in new sources of generation, which is anticipated to create a continued strong focus on the development of renewable energy projects.
- Start-ups have opportunities to use IoT and other smart technology to help energy retailers and customers to cost-effectively use their EV's battery life. Government and the private sector have key roles to play in influencing standards in V2I (vehicle-to-infrastructure) technology. Without a vehicle manufacturing industry here, it's unlikely we'll influence V2V standards, but advanced infrastructure businesses operating in Australia can and should advocate for a range of trials to generate data that will influence V2I standards and create opportunities in Australia.
- Similarly, Australian software developers should focus on software outside that which drives the CAV themselves, according to Damien Bailey. For example, by developing systems that cities can use to collate and mine the data being generated by the various vehicles and items, and make recommendations. Huawei recently released an Intelligent Operation Centre, with a dashboard for collecting, monitoring and analysing data, and using it to make decisions about city planning, security and emergency response, among other things.
- Kevin Bloch also cites open data as "an opportunity for Australia to generate new small businesses and new jobs who can leverage data in the transportation environment. We're already starting to see that with some of the apps we have on our phones now, that's through open data. But as we move forward with connected and autonomous vehicles, I think we could generate a whole industry here of start-ups who can leverage that data."

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>
> KEVIN BLOCH
> CHIEF TECHNOLOGY OFFICER, CISCO

DRIVING FORWARD

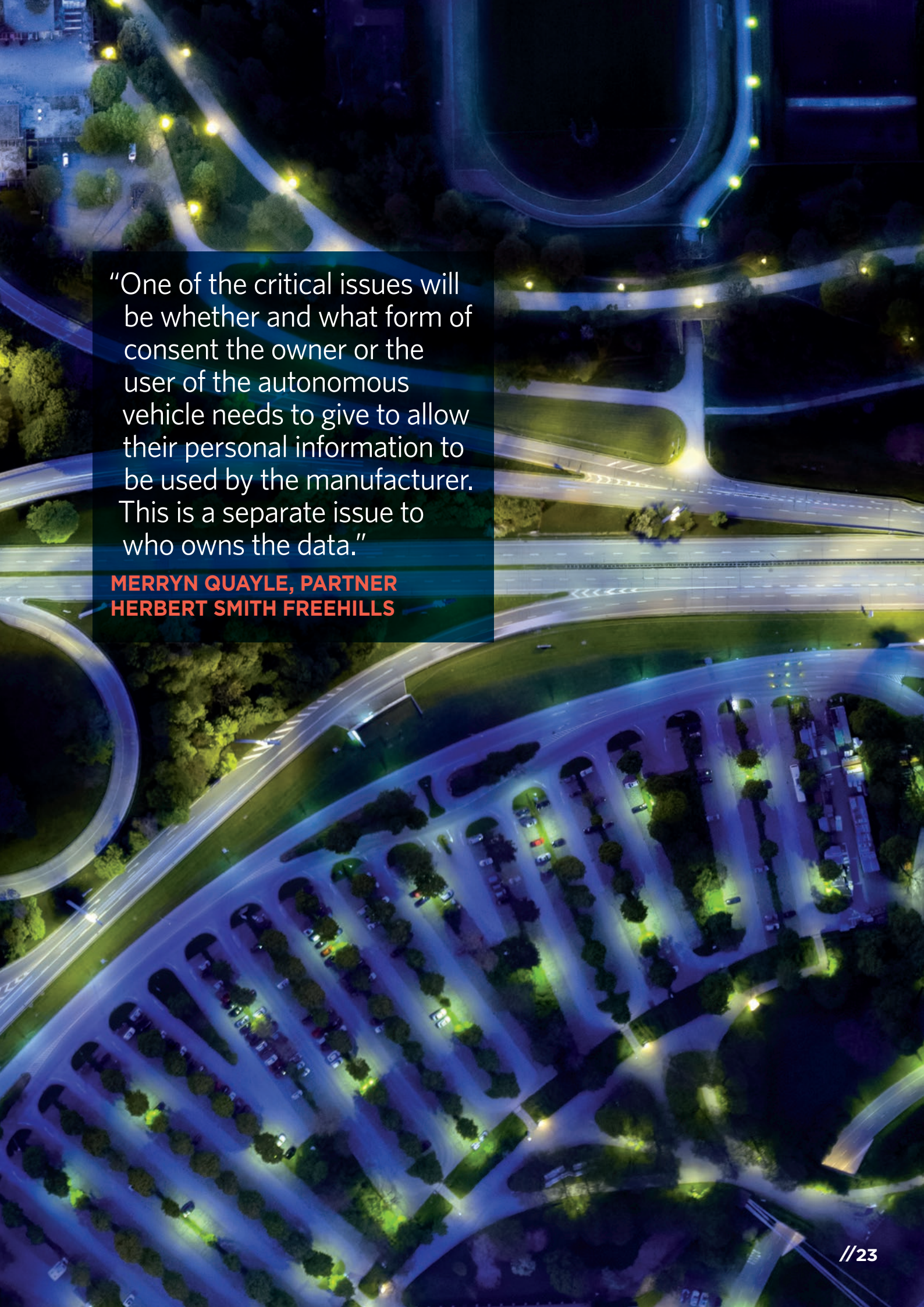
- With connected devices set to revolutionise urban life within ten years, businesses will need to consider the impact to their business model and service/product offering, to determine how to leverage the opportunities presented by this connectivity.
- Data will be the oxygen of smart cities and successful companies. Businesses must analyse the data they currently collect, consider the ownership position in relation to that data, identify opportunities to collect new data, and determine what, if any, commercial opportunities exist for this data - now or down the track.
- Companies with the expertise to analyse, manipulate and present the data picked up by IoT devices will hold the key to success. Stakeholders in the CAV environment, whether it be infrastructure providers, insurers, government or otherwise, must consider how they will engage with these companies or invest in bringing IoT and augmented intelligence capability to their business activity.
- Smaller technology players can have a disproportionate impact because there is a lower investment cost to market entry.
- Infrastructure participants (including government) must incorporate flexibility into long term concession agreements to cater for the advent of CAVs and future alternate uses for physical infrastructure - and to consider how the benefits of such technology might be shared. They should also be examining how existing long term concessions will respond to CAVs and the likely impact on the economics of such arrangements.
- Infrastructure participants should revisit planning requirements that may not be fit for purpose in a CAV dominated environment (for example, mandatory parking).
- Companies must consult with employees and unions to manage workforce transformations and ultimately avoid lengthy delays in the adoption of CAV technology across industries.

Balancing risk and opportunity

While the transformative potential of CAV technology on public safety, efficiency, productivity and mobility is momentous, the reality is we are at ground zero and there are substantial challenges that need to be addressed before we are ready.

The high volumes of data and various data sources present data ownership and privacy risks. With a multitude of players involved in manufacturing and operating CAVs (including providers of IoT and data storage) challenges with cyber security, insurance liability and intellectual property become more prevalent.

Currently there is no common international approach to how some of these legal issues are to be dealt with. So the opportunity for Australia is to develop something that is fit for purpose here and that can work on an international scale. Given legislation has a long lead time to make changes, we need to start thinking about the issues and working through them now.



"One of the critical issues will be whether and what form of consent the owner or the user of the autonomous vehicle needs to give to allow their personal information to be used by the manufacturer. This is a separate issue to who owns the data."

MERRYN QUAYLE, PARTNER
HERBERT SMITH FREEHILLS

Data stakes are high

Data will be generated from within the vehicle, from the infrastructure surrounding it, from other vehicles on the road and traffic signals, and data will also be generated by the passengers. Given this data will be generated by and collected by various sources, it begs the question who will own and control the data? Secondary to this is how can this increasingly valuable commodity be monetised?

To understand the debate about data ownership, privacy and protection, Cisco's Kevin Bloch describes two types of data that each require a different approach to legislation. "One is the real time data the vehicle produces that is required for machine learning and to keep people safe on the road. We have got to encourage open sharing of this data between manufacturers, but ultimately manufacturers should own this. The second is personal information which is a generic problem currently playing out with the recent Facebook and Cambridge Analytica scandal".

But working out when data is and isn't personal information can be tricky. Kaman Tsoi, Head of Data Protection and Privacy Australia at Herbert Smith Freehills, says that "de-identification of data can help reduce privacy compliance requirements, but as the ability to match and link data sets continues to grow, there will be a need to assess and monitor whether apparently de-identified data actually allows the individual's identity to be determined".

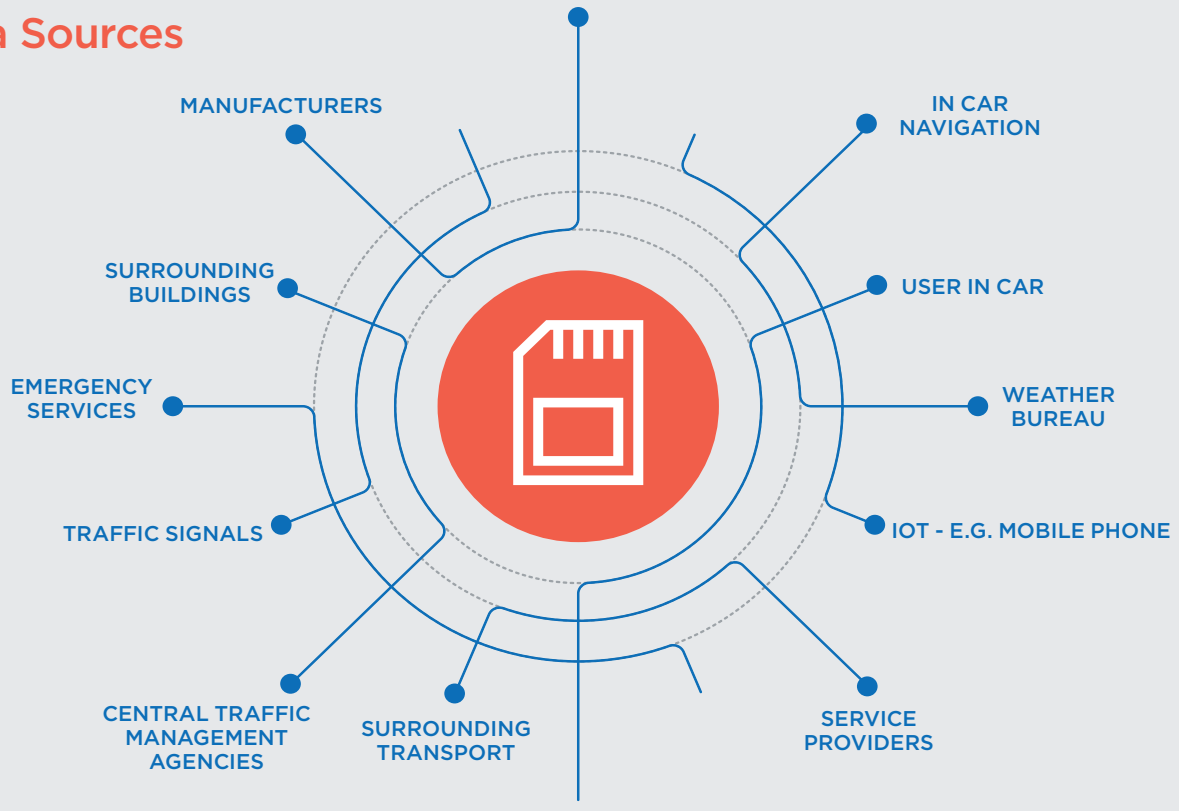
In 2015, ABC reporter Will Ockenden showed how his telecommunications metadata (communication times, cell tower locations, who was called and texted, without the actual phone numbers) could be used to work out where he lived and worked, how he commuted to work, when he moved house, where he spent his Christmas holidays, which flights he caught and who his siblings were.

Aggregated data can also be put to intended and sometimes undesired uses, even if no specific individual is identifiable. In 2017, fitness tracking app Strava released a heatmap showing the locations of fitness activities tracked by its users around the world. This was then used to identify the likely locations of US military bases in countries like Syria, Afghanistan and Djibouti, as well as showing the layouts of some of these bases.

Companies are increasingly being expected to adopt 'privacy by design' approaches, including undertaking privacy impact assessments (PIAs), when developing new projects affecting personal information. In the EU, the new General Data Protection Regulation (GDPR) is making PIAs mandatory in some cases. PIAs involve mapping information flows and considering issues such as over-collection of personal information, privacy notices, customer choice and defaults, direct marketing, international data transfers, data accuracy and security.

Merryn Quayle, Partner at Herbert Smith Freehills sees privacy and consent as a key issue that needs to be considered where personal information is involved. "One of the critical issues will be whether

Data Sources



and what form of consent the owner or the user of the autonomous vehicle needs to give to allow their personal information to be used by the manufacturer. This is a separate issue to who owns the data." Third-party users of CAVs – such as a pizza-delivery person using the owner's vehicle - will be even more difficult to determine.

The main data opportunity for Australian businesses is to identify what data they do and are permitted to collect, ensure they own and can use it, work out its potential value, and commercialise it. The value of held data may not be apparent immediately: "Having three, five, ten years of data might be quite a valuable investment in the future, so companies should keep looking for ways to commercialise it and ensure they have privacy consents where necessary," says Damien Bailey. "Whoever owns the data owns the future."

Having three, five, ten years of data might be a valuable investment in the future, so companies should keep looking for ways to commercialise it and ensure they have privacy consents where necessary. Whoever owns the data owns the future.

DAMIEN BAILEY
PARTNER, HERBERT SMITH FREEHILLS

Cybersecurity risks

Irrespective of who owns the data and how it's commercialised, hacking and cybersecurity are increasingly prevalent risks.

The more devices, and cities become connected, the greater the potential risk of a cyber attack. With a high degree of connectedness, smart cities could be especially vulnerable. Designed for the centralised and efficient allocation of resources - power, traffic management, emergency services - it's possible to imagine a situation where a smart city's centralised systems could be hacked. Because the stakes are so high, the most sophisticated hackers, right up to nation states, could be motivated to attempt cyber-attacks on CAVs and traffic systems.

Risk management is essential, including security standards compliance, swift deployment of security patches, security risk assessments, frequent testing and emergency response planning. Agreeing a set of security standards will require considerable industry and government co-operation.

While human error is responsible for many road accidents with driver-operated cars, moving to CAVs creates risks of human error in software, communications systems and other areas, with similar and sometimes multiplied consequences.

Meryn Quayle confirms "where there is a human input somewhere along the supply chain, whether it be for example the manufacturer or cloud provider, this is where the issues will arise, through carelessness or ignorance. The weakest link we often see is in the small to medium companies who are providing outsourced services, whose own systems might not be as strong as the system that they're connected into."

With mandatory data breach notification now a reality in Australia, companies also face regulatory penalties and significant reputational harm if they suffer a serious data breach, or fail to respond to one effectively. This provides another reason to ensure strong security measures are in place, but also to look at things like breach detection, data retention, response planning and contractual arrangements with supply chain partners.

Points of vulnerability

- driving mechanisms
- vehicle sensors
- communication and data systems
- power/fuel systems
- locks and keys
- software
- security patching
- security testing
- staff clearances
- incident response
- supply chain participants
- traffic signals

Securing and protecting IP rights

As the development of CAVs requires a high degree of innovation, the technology is likely to generate an enormous amount of intellectual property. There could be hundreds of different rights owners contributing IP to different aspects of one single CAV.

Patents, copyright, designs and confidential information are the key IP areas for CAV technology. The value in the underlying IP can be illustrated by the reports out of the USA in mid-2018 of the FBI apprehending an engineer involved in secretive CAV research for one of the major consumer electronics companies, who had stolen valuable IP and was attempting to board a flight to China.

> **In a trial, joint development agreements must be clear on who contributes what IP, who will own the IP generated from the project - and who has the right to commercialise it.**
>
> PATRICK SANDS
> PARTNER, HERBERT SMITH FREEHILLS

Some of this IP will be generated through collaborative trials as the technology is tested in public. Despite calls for open sharing of trial-generated data, Patrick Sands warns that inventions developed during a multi-party trial often result in disputes.

"In a trial, joint development agreements must be clear on who contributes what IP, who will own the IP generated from the project - and who has the right to commercialise it."

That said, CAV trials are essential to generate the knowledge necessary for developing standards. Although international standards are still some time away from being agreed, they are under development in the major markets and now is the time for the leading innovators to be influencing the debate over what is essential for a particular technology to work. Given the potential value of licensing revenue from CAV standards, we may see an "arms race" between industry players to contribute patented technology to the standards, while reserving for themselves any key differentiating technology that may be important to distinguish themselves in the market.

Disruption for insurers

While insurers are grappling with disruption to their business model on many levels, safety remains the fundamental driver of how the conversation on liability will develop over time. Big data will allow insurers to increasingly customise their offering to individuals and companies. Data including how much a vehicle is used, where it goes, how it accelerates around corners and goes through stop signs could all contribute to a much more detailed risk profile of the CAV user, not only allowing a customised quote, but ensuring insurers can better manage their own risk.

David Harrington, Group Executive Strategy and Corporate Development at Insurance Australia Group, identified two significant trends in the sector: the adoption of safety-approved CAV technology by individuals and fleets, and then individual vehicle owners abandoning private motor vehicles for ride-share models. Both trends will cause many changes for the industry.

"We're expecting to see a shift from personal motor vehicle insurance to more commercial, which might include manufacturer liability or the liability or insurance for commercial operators of fleets. We're also seeing changes in the type of commercial insurance so with CAVs there will be a lot of different layers of liability."

There are so many different permutations as to what could go wrong in CAVs and who might be held responsible, so the insurance sector will need to identify how best to price those different risks and ensure the right covers are in place. David Harrington confirmed, "research has shown the software required to operate CAVs could be 20 to 25 times more complex than what you see in a Boeing Dreamliner. These are extremely complex ecosystems of technology components". Some data will be living in the Cloud and some will be resident in the actual vehicle. Vehicles will need to be connected to the Cloud to be able to continue to get updates around the systems that are running and will need to be able to operate for periods of time without connectivity. Insurers will need to work collaboratively with equipment providers globally to build a new insurance architecture that can price for the different risks and be flexible into the future as more scenarios become available.

> **The software required to operate CAVs could be 20 to 25 times more complex than what you see in a Boeing Dreamliner.**
>
> DAVID HARRINGTON,
> GROUP EXECUTIVE STRATEGY AND CORPORATE DEVELOPMENT, INSURANCE AUSTRALIA GROUP

Changes to compulsory third-party insurance schemes

The current compulsory third-party (CTP) system poses significant barriers to trials in Australia. The CTP landscape is complex because different states and territories have very different systems. Some are public, some are private, some are fault-based, some are no-fault. Anne Still related how the RAC Intellibus trial needed to restructure the insurance policy of the entire group of businesses in order to provide CTP coverage to the trial.

Marcus Burke said the NTC is looking at issues around CTP insurance and automated vehicles, with a consultation paper to go out later this year considering whether automated vehicles should be in or out of existing CTP schemes, and if they're out, what other kind of insurance obligations would be necessary for the responsible parties.

Definitional changes dealing with concepts of 'driver' and 'control' will be introduced to ensure the existing insurance system works, and that the CTP and product liability regimes work together. But ultimately the CTP system is premised on lots of accidents occurring, which is likely to decline with the increasing use of CAVs. A tipping point will occur at which there will be much more liability being channeled through to product manufacturers and liability insurers.

Forging new territory on product liability

A big shift from CTP insurance to product liability will extend a web of liability (and insurance) behind the manufacturer. There will be many people involved in how autonomous vehicles operate - data providers, fleet maintenance and vehicle repair to name a few - who may potentially be culpable in the event of an incident.

Courts are accustomed to change in product liability, having dealt with the application of legal principles to significant technological advancements in areas such as pharmaceuticals and medical devices. While the legal principles of product liability are well established, CAVs will undoubtedly bring about novel issues that existing precedents do not directly address. Who controls and owns all the data that will be collected during a journey in an autonomous vehicle and how can that data legitimately be used as evidence of who was in control of a vehicle when it crashed? There will also be a need for expert witnesses who can translate the data and assure a court that it says what it is meant to say.

> **Vehicles will be self-reporting incidents with all the available data and which are then run through an algorithm, possibly by reference to industry-wide agreements, with a netting-off of various liabilities.**
>
> GUY NARBURGH
> SPECIAL COUNSEL, HERBERT SMITH FREEHILLS

There is a possibility that eventually determinations of liability will happen outside the court system and to some degree be automated. Guy Narburgh, Special Counsel at Herbert Smith Freehills, considered a future where vehicles "will be self-reporting incidents with all the available data which are then run through an algorithm, possibly by reference to industry-wide agreements, with a netting-off of various liabilities. Then once a month a bill turns up and a payment is made subject to appeal rights or something similar. This will be a more cost-effective way of dealing with liability matters than through the courts."

DRIVING FORWARD

- Industry must work with government to help them understand the key issues they need to consider and plan for in relation to data, technology and security.
- Companies must interrogate the data they already collect, or identify data they could begin collecting, adopting a 'privacy by design' approach. They should be analysing the value of this data to understand the opportunities to commercialise it.
- Cyber-security must be incorporated into the design of CAVs and IoT devices. Broader security risk management steps must also be implemented.
- Car manufacturers are well placed to own data generated from CAVs, subject to privacy restrictions on use. Government must consider if this is right and legislate accordingly.
- In a joint development project, ensure clarity over the IP that is being contributed by each party, who owns the IP that will be generated by the trial or project, and who will have the rights to commercialise and exploit.
- Companies should consider how far-reaching the effect of CAV transformation could be on their industry or business model. Give thought to less obvious risks and opportunities, because CAVs will change how society has traditionally operated.

CASE STUDY

RAC Intellibus

The paramount importance of trials to the rapid adoption of CAV in Australia - and to consumers' confidence in using the technology - is one of the key takeaways from The Royal Automobile Club of WA (RAC) trial of a driverless bus currently underway in Perth.

As a not-for-profit organisation representing more than one million members, RAC advocates for safer roads and easier, more sustainable transport. In 2015 it began the trial with three objectives:

- to increase understanding about the impacts and opportunities of driverless vehicles,
- to give West Australians and visitors the opportunity to experience an automated vehicle while in the early stages of its development, and
- to work with local and State government partners to plan the safe transition to a CAV environment.

The Intellibus is a fully autonomous electric shuttle bus at level four automation, which means that there's no steering wheel, no driver's seat, no pedals. The vehicle can steer, brake, accelerate, monitor inside and outside the vehicle, and respond by changing lanes, turning, and using signals. Because it fell outside Australian design rules, RAC imported the vehicle under the test and evaluation category, and required a special exemption from the Director-General of the Department of Transport in order to take it on public roads.

Prior to the trial, Herbert Smith Freehills advised RAC on issues to address in finalising the contract with the French manufacturer of the Intellibus, according to Senior Associate Matthew O'Leary. "These included ongoing access to data, receipt of future software updates, clarifying the cost of updates and the party responsible for testing them, privacy protections, cybersecurity, insurance and liability questions."

The trial

The first stage of the trial comprised two months of off-road testing at RAC's private driving centre, according to a plan RAC developed in consultation with the manufacturer that was tailored to local conditions. The bus was retrofitted into the existing traffic environment, complying with all existing driving laws.

The second stage saw the Intellibus on a public road but without consumer participation. Since August 2017 the trial has been in its third stage, with the bus operating on the road and open to the public. The bus travels 3.5km along the South Perth foreshore, a route that takes in a strip of cafes, residential apartments, heavy vehicle traffic and general traffic.

Enthusiastic consumer response

Consumer demand to test-ride the shuttle bus exceeded expectations, with 2,000 rides selling out in the first hour they were offered to the public. Since then, 8,000 people have ridden the Intellibus, with 99% of RAC survey respondents believing it to be a viable mode of transport for the future.

Biggest challenges

RAC's Anne Still, who is responsible for the trial, said the biggest challenge was fully understanding the technology. One of their earliest hurdles was having to retrofit an entirely new radio system because they did not understand that the one designed for the vehicle was quarantined in Australia for aviation and was thereby off-limits.

Keeping up with the software developments was another challenge. Within the first eight months of the trial there had been 14 major software upgrades, and the change in the shuttle's capabilities over that period was significant.

On the road, 65% of issues were external to the vehicle, and 90% of those were to do with the Intellibus making contact with cars parked outside the designated borders of a car space.

Takeaways

- Public trials are crucial to learning and developing the technology. Road authorities need to have greater flexibility around how trials operate, for example removing barriers around CTP insurance coverage so that trials can be covered under State insurance schemes.
- Assigning responsibility with an Advanced Driving System Entity will be challenging unless manufacturers fully disclose what a CAV can and cannot do.
- Consumers regard safety as both a key concern and a perceived benefit of CAV technology. Delivering on safety and communicating the benefits - fewer crashes and reduced severity of crashes, greater independence and mobility for segments of the population excluded from existing public transportation systems - will be key.
- Expect to see autonomous shuttle buses first in controlled environments - hospitals, university campuses.
- Multi-sector public-private partnerships with open and transparent relationships are essential to success.

Next steps

The Intellibus trial is set to expand in 2018-19 with exclusive access (along with one other city in the world) to a CAV launched in Paris in November 2017. RAC will purchase five of these vehicles, which seat six and will be hailed on demand via an app, anywhere within a ten-kilometre radius.

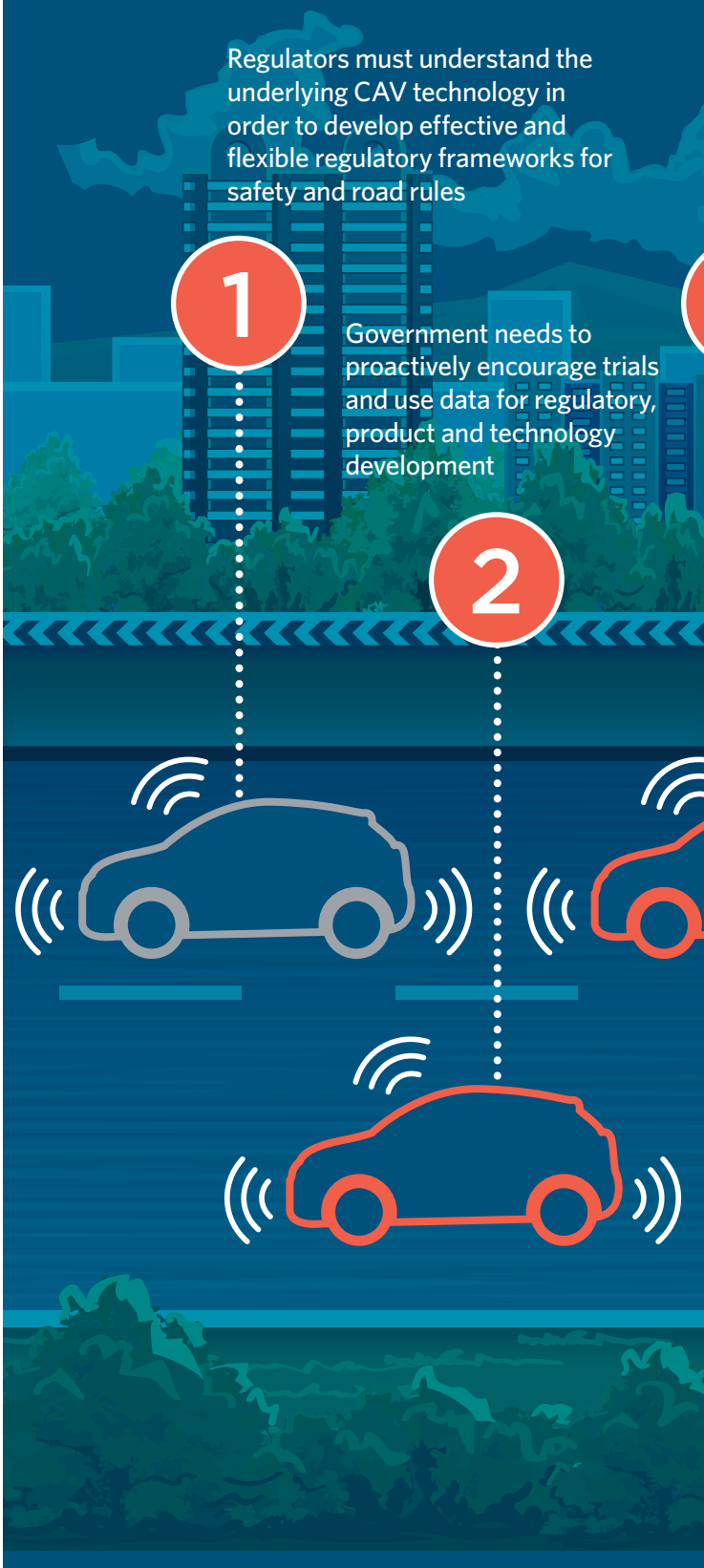
> **Ordinary people are making everyday mistakes and paying for it with their lives on our roads. About 18% of Australians have a disability, and 700,000 people can't use public transport. To solve these really big societal problems we need really bold responses, and that's what autonomous vehicle technology is. It's a big solution to some really big problems.**
>
> ANNE STILL, GENERAL MANAGER PUBLIC POLICY, RAC WA

Preparing Australia: connected and autonomous vehicles

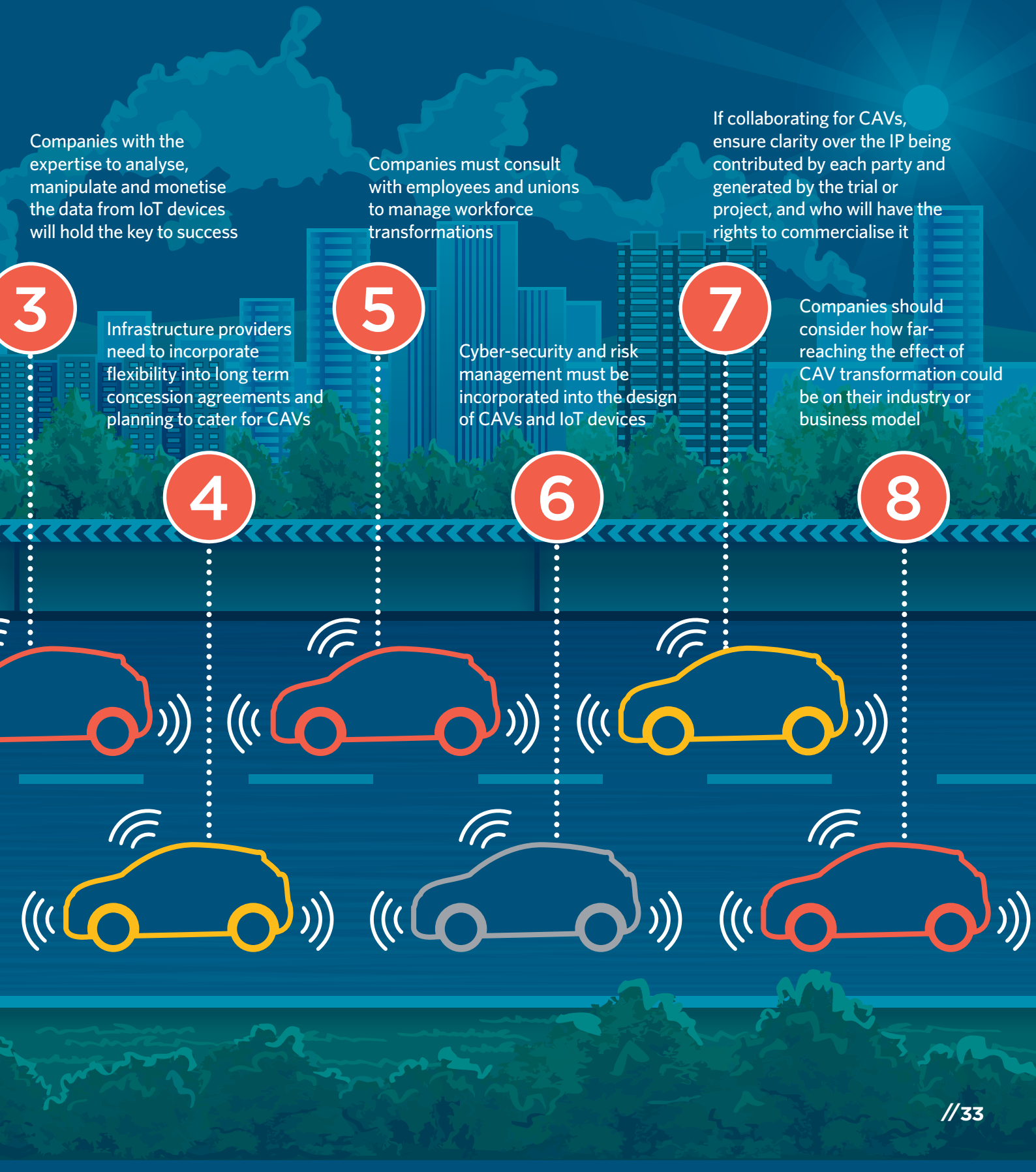
Public safety remains the highest concern for all stakeholders developing CAV technology. Without consumer confidence, the extraordinary promise of CAVs - both in social benefit and in commercial opportunity for industry - will remain just that.

Australia has the opportunity to play an active role in introducing driverless cars to our roads and contributing to discussions on international standards. However, government and industry will need to work collaboratively to address the many structural challenges that stand in the way of a true revolution in mobility. Striking the balance between legislative reform and openness to innovation will be a constant challenge. But gradually, through investment, trials, testing and sharing data, international standards will emerge to help innovation flourish, ushering in an exciting and unparalleled transformation of daily life that holds untold opportunities for government, business, and citizens alike.

To prepare Australia



for connected and autonomous vehicles:



How our team can help

The advent of connected and autonomous driving technology is being hailed by many as the fourth industrial revolution.

While this technology undoubtedly presents a wide range of business opportunities for many sectors, the pace at which it is developing, combined with the evolving global regulatory landscape, poses a number of novel and challenging legal issues.

Herbert Smith Freehills has formed a global Connected and Autonomous Vehicles Group to advise clients on the various business and legal issues arising from the development and commercialisation of connected and autonomous driving technology.

The group provides a multidisciplinary global team that is focussed on the legal aspects of connected and autonomous vehicles, including:

- Competition
- Cyber security
- Class actions
- Crisis prevention and management
- Data protection and privacy
- Employment and Industrial Relations
- Environmental
- Infrastructure and smart cities
- Insurance
- Intellectual property
- Product liability
- Projects
- Planning
- Regulatory

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