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The new road to the future

Realising the benefits of autonomous vehicles in Australia

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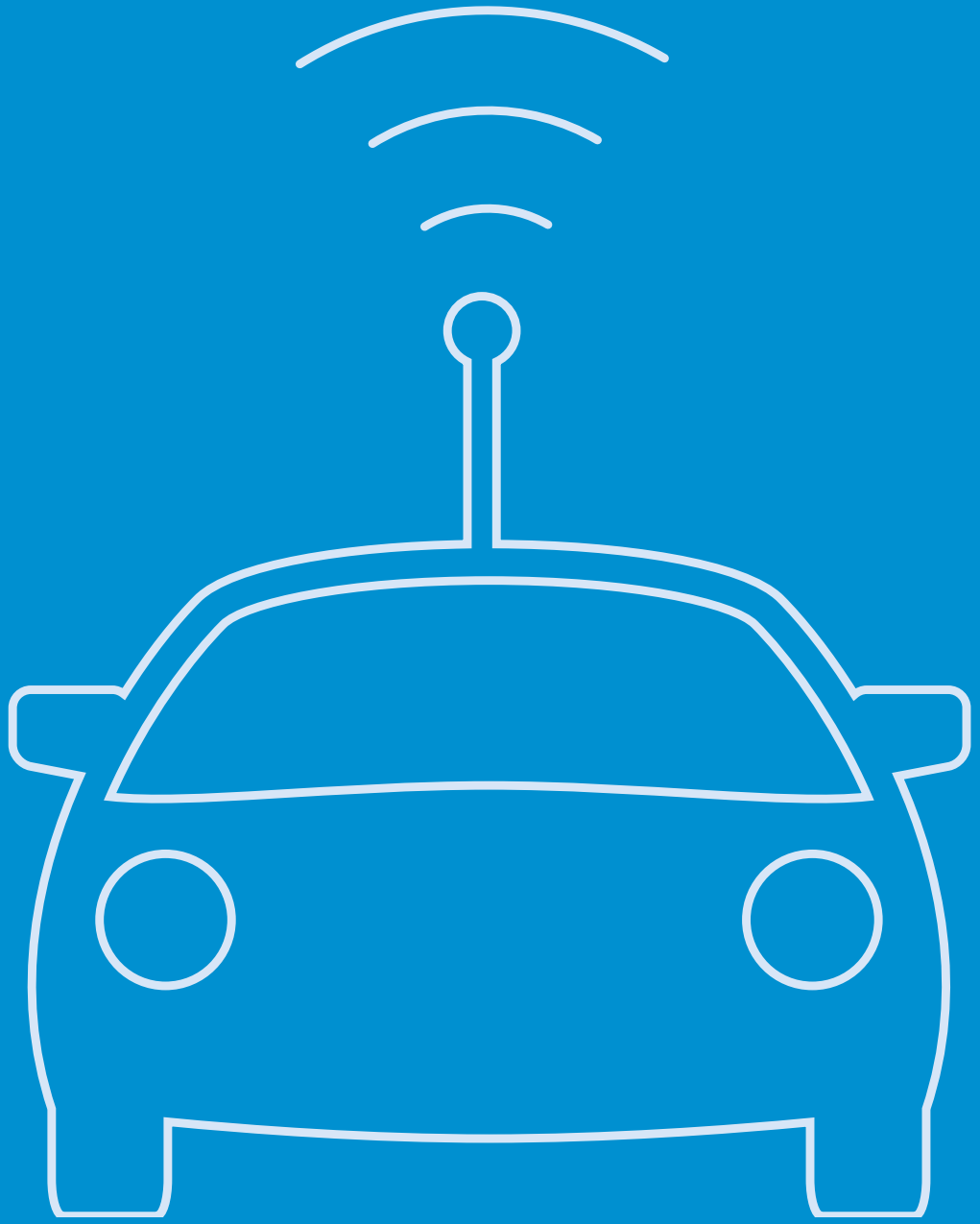

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Executive summary

Once just a fictional vision in movies such as *Total Recall*, the era of autonomous vehicles is now upon us. Organisations as varied as Google, Mercedes-Benz and Stanford University are exploring and harnessing the power of driverless vehicles to enhance their operations and deliver new services to consumers. Moreover, Australia is at the centre of this technological revolution.

For instance, Rio Tinto is using driverless vehicles to move millions of tonnes of mining material in the Pilbara in Western Australia.[1] The University of New South Wales and the car-sharing service GoGet, are working together to develop self-driving cars, tailored for the local market.[2] In addition, research from Curtin University in Western Australia points to driverless cars being within the average Australian's price range in a decade.[3]

Indeed, Australia offers the ideal market to test and refine autonomous vehicles. According to Larry Burns, former Corporate Vice President of Research and Development at General Motors, who was interviewed as part of this research report, "Australia's population densities are perfectly suited ... and one city in particular that stands out is Canberra."[4] He also notes that Australia has the technical and manufacturing expertise – in locations such as Adelaide – to be a key player in developing the cameras, lasers and software required for these autonomous vehicles.

However, companies and organisations in Australia should be doing more to prepare for the arrival of autonomous vehicles because they are expected to be a highly disruptive force – one that will have a significant impact, far beyond automotive companies and suppliers.

A number of key questions come to mind when one considers the impacts and opportunities associated with autonomous vehicles. Will autonomous vehicles require airbags and make accidents history? Will this disrupt insurers' existing business models? Who will be liable in case of an accident? Is it the auto maker or the technology provider? Will autonomous vehicles accelerate the adoption of alternative energy sources, and play a key role in the development of intelligent cities? Can the government achieve 100 per cent compliance with public vehicle regulations – eliminating traffic light and speeding violations, for example – or reduce emissions?

Autonomous vehicles promise to deliver safer roads, reduced environmental impacts, more compelling products and applications for consumers, and fresh revenue streams for companies. However, realising these benefits requires organisations in sectors as diverse as automotive production, public transport, telecommunications, energy and financial services to innovate and introduce profoundly different business models to remain competitive.

This research report is designed to help Australian companies move ahead of the curve with autonomous vehicles. The report encourages organisations and whole industry sectors to understand the opportunities – and potential impacts – of automation, and learn what capabilities they may need to develop to benefit from this disruptive new technology.

We also provide specific recommendations to help organisations develop the right strategies and start taking action, to verify they can successfully navigate this new road to the future.

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Towards an autonomous future

What are autonomous vehicles?

In the context of this report, the term 'autonomous vehicles' refers to automobiles that are powered by autonomous technologies, and are capable of travelling without humans controlling the vehicle.

This is not an abstract development. In fact, we could see self-driving cars on our roads in the next three to five years. For example, Volvo's Drive Me project expects to deliver 100 self-driving cars to customers by 2017[5]; and technology giant Google expects to have its self-driving cars delivered between 2017 and 2020.[6] In the next decade, Mercedes-Benz hopes to introduce its Future Truck 2025, complete with a 'highway pilot' automated system through which the truck communicates with nearby vehicles.[7]

According to industry estimates, by 2020, the autonomous vehicle market will be worth US$87 billion.[8] Furthermore, by 2040, four out of every 10 vehicles on the road could be autonomous.[9]

Drivers for change

These trends are expected to radically reshape transport networks around the world by reducing congestion, fatalities and fuel consumption, and improving other driving conditions.[10] Human error contributes to thousands of preventable deaths each year; the self-driving cars have the potential to reduce this statistic to zero.

In addition, autonomous vehicles could offer substantial cost savings. Experts such as former General Motors executive Larry Burns, believe driverless trucks could reduce costs in the line-haul trucking industry by 40 per cent. By switching from traditional car ownership models to a shared driverless model, the costs of car ownership (based on US modelling) could fall from US$0.70 per mile to around US$0.15 per mile - a 78% reduction.[11]

Finally, self-driving vehicles will merge with other technologies to give companies a unique opportunity to redefine how they interact with consumers. For example, Apple's CarPlay integrates iPhone apps and functions into a car's in-vehicle entertainment system. Ferrari, Hyundai, Mercedes and Volvo have said they will integrate CarPlay in upcoming models.[12]

Local impact

In Australia, the impact of autonomous vehicles will be far-reaching. The autonomous vehicles themselves will function as a platform, which can be harnessed by individuals, businesses and organisations. As a result, we could see the emergence of automated-vehicle-as-a-service business models, rather than the traditional one-off-purchase, ownership-based models.

This trend will, in turn, allow companies to move beyond business models underpinned by one-off sales, and shift to ongoing monetisation opportunities based on creating an ongoing connected experience for consumers. Teenagers are putting off buying a new car for a variety of reasons, but are increasingly loyal to their mobile phones. Their priority is to interact more with their friends, rather than 'driving around just for the sake of driving'. People in this generation, as US company Zipcar points out in its annual survey, would be more at loss without access to their mobile devices than without access to a car.[13] The average Gen Y consumes a lot of social media in a day. Based on Accenture's global research, we have identified the seven sectors that will be most disrupted by the autonomous vehicle era (see Figure 1).

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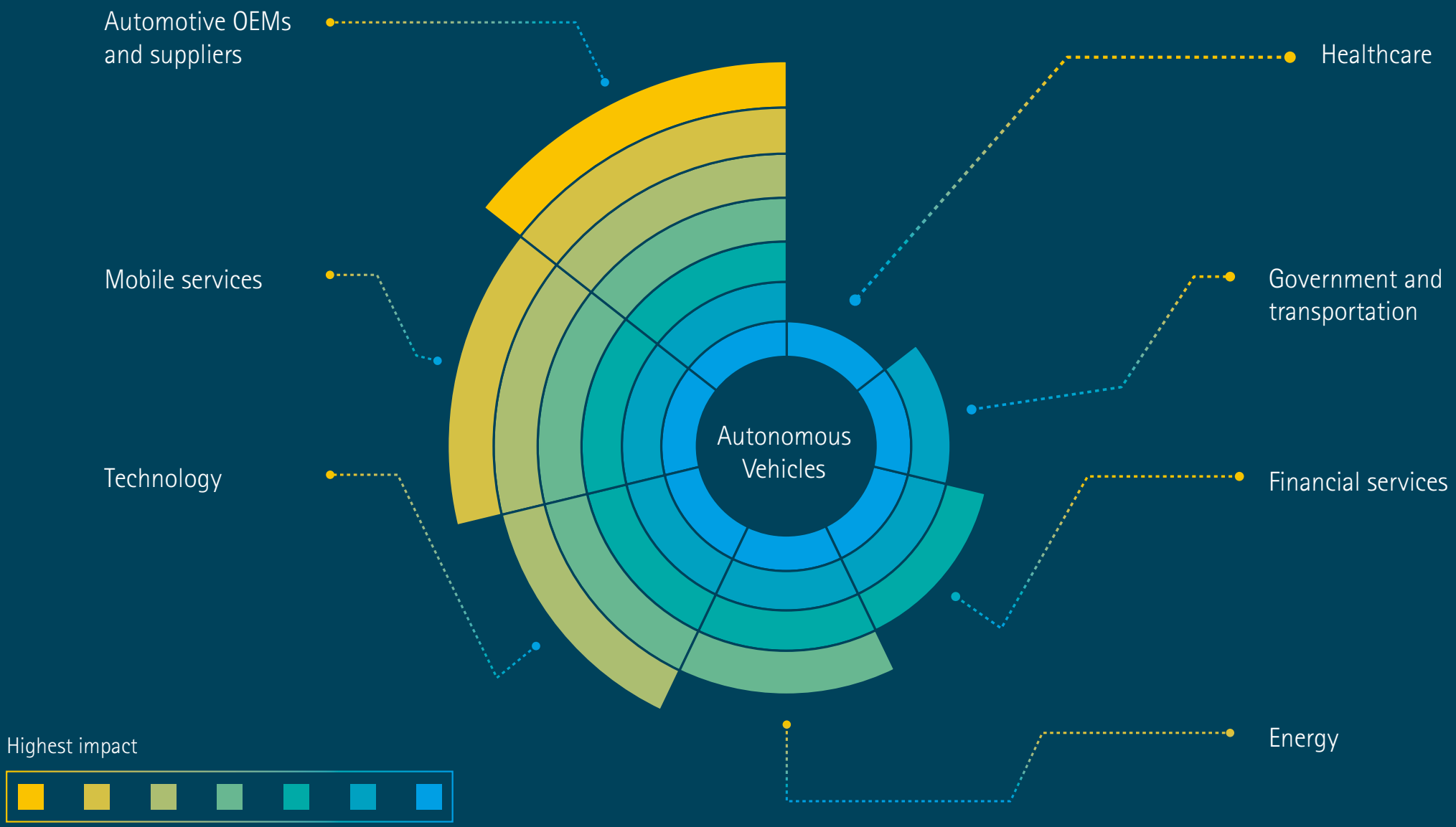
Figure 1: Autonomous vehicles will affect many industries



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How autonomous vehicles will reshape our economy

Autonomous vehicles will open up new opportunities and create an impetus for innovation among organisations from a wide range of industries – globally and within Australia specifically. The potential areas for change are highlighted in Figure 2 and discussed in more detail in this section.

Automotive OEMs and suppliers

Is this a new dawn for car companies?

With autonomous vehicles, automobile makers have a new platform to drive competitiveness and relevance in a hyper-connected environment. In effect, car makers shift from just making vehicles to providing consumers, governments and businesses with cutting-edge services.

To capture these opportunities, original equipment manufacturers (OEMs) and other suppliers will need to work closely – and perhaps partner – with providers on hardware, software, consumer-centric services, and research and development. Indeed, these collaborations are already being undertaken around the world:

- Chinese internet search giant Baidu is collaborating with BMW on automated driving trials in Beijing and Shanghai[14]
- Ford is working with MIT and Stanford University to advance autonomous vehicle research[15]
- Leading automotive supplier Continental is working with Cisco Systems to develop reliable, high-speed network connections between autonomous vehicles.[16]

Mobile service providers

Will autonomous vehicles be the catalyst for new mobile networks?

According to Gartner by 2018, 20% of all new vehicles will be self-aware by capturing their systems status, positioning and surroundings' state in real-time.[17] We believe this will accelerate the need for higher data transfer speeds, greater data storage capacities, better sensors, and faster vehicle-to-vehicle and vehicle-to-infrastructure data exchanges. These needs will create new and potentially attractive revenue opportunities for mobile service providers.

For example, autonomous vehicles could significantly increase data consumption patterns, which may require mobile service providers to build new capacity, products and services. In addition, telecommunications OEMs stand to benefit from greater network capacity and coverage in selling their products to consumers.

Technology providers

Could software companies be the big winners from driverless vehicles?

Autonomous vehicles offer substantial opportunities for a range of technology providers, including companies involved in application development; big data and analytics; cloud and IT services; security software; and vehicle engineering.

For example, the information generated from automated vehicles could be stored in the cloud. Transportation agencies would then access this data, use sophisticated analytical tools to understand it, and apply the findings in designing and developing new roads and more efficient transportation systems.

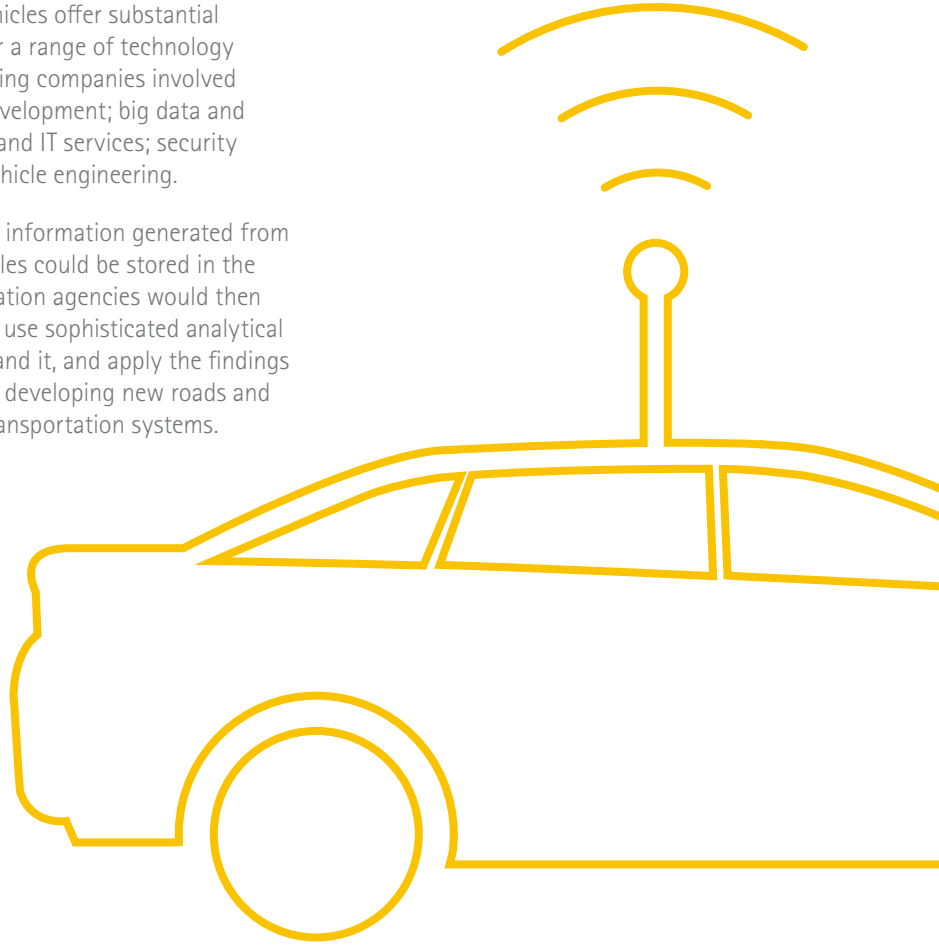

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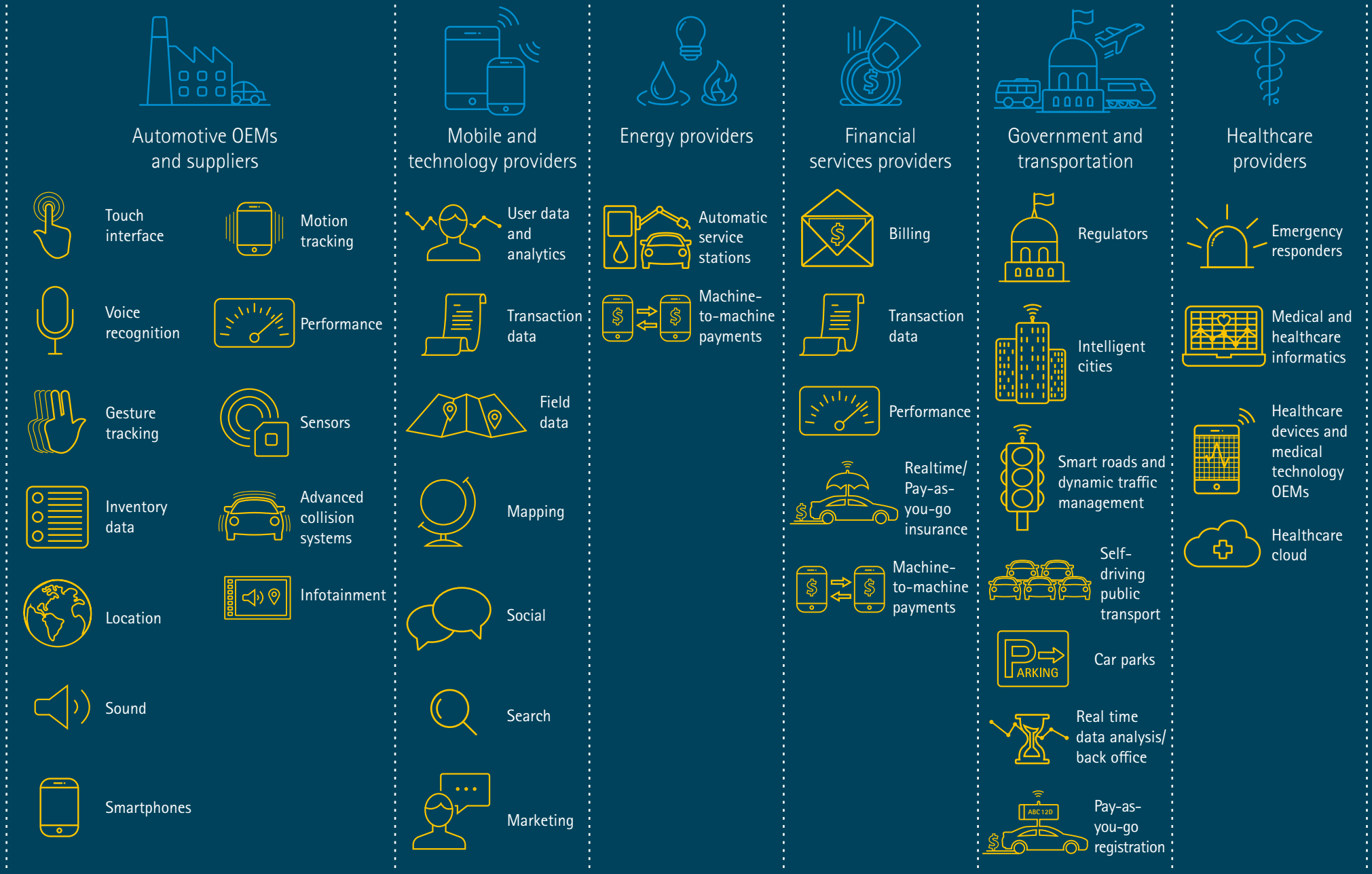
Figure 2: Autonomous vehicles offer significant opportunities for Australian industries



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Technology providers (cont.)

Automated vehicles will require sophisticated diagnostic and predictive tools to understand and interpret the behaviour of other drivers, and the impact of traffic conditions. This means vehicle makers will need software providers to develop the right frameworks for their automated vehicles. In addition, because drivers will no longer need to operate their cars while travelling, vehicles could become mobile workstations. This could create, for example, an opportunity for app developers to target automated vehicles when they pitch their workplace productivity offerings.

The common link between these opportunities is getting the right software in place. We are already witnessing the world's top computing companies – Apple, Cisco, Google and Microsoft – integrating their products with in-vehicle systems. This includes potential new revenue streams for technology and software companies, created by:

- securing the software running the car and the components connecting to the internet
- enhancing identity and access management to secure applications running within the vehicle
- establishing communications between vehicles and internet-enabled devices
- boosting software reliability (including software upgrades) and cyber security.

According to Larry Burns, the potential winners from autonomous vehicles are largely the technology, software and data platform providers. That is, the companies that design the algorithms for the vehicles; the apps that enhance the autonomous experience; and the cameras, lasers and sensors that record data created by the autonomous car.[18]

Energy companies

Could cars become off-grid energy suppliers?

Autonomous vehicles could also have a major impact on the energy industry. For instance, in terms of energy consumption and provision, these vehicles serve a dual purpose. A mode of transport by day, they could then offer households cheaper forms of energy when they refuel at night. In the South Korean city of Gumi, authorities are testing technology that uses inductive charging for vehicles on the move.[19] This technology may reduce demand for certain types of energy, and create new opportunities to deliver energy back into the grid, which could affect energy providers' businesses.

Alternative charging technology is also being considered in locations such as London, where the city's public transport system is investigating wireless charging options that allow buses to run without traditional engines. So as autonomous vehicles become more prevalent, energy providers may need to consider how they can profit from this disruptive force, such as using alternate energy sources to generate power, designing innovative service stations and in-road charging systems, and partnering with car companies to better understand autonomous cars' energy needs.

Financial services providers

Will autonomous vehicles reshape ownership models and introduce new revenue streams?

Autonomous vehicles have the potential to expand consumers' access to their banking and financial services products. This opens up a new avenue in terms of revenue streams – including in-car purchases, and harnessing the connected car to pay for fuel and tolls. However, with increased connections comes a greater need for information security. Banks and other financial institutions may need to boost their investment in machine-to-machine security and alternative authorisation technologies to support the systems that allow these cars to pay for services they consume during the course of each journey.

Autonomous cars may also spark a move away from traditional vehicle ownership models. This could alter the nature of car financing and galvanise banks to create new lending products for autonomous vehicles, including products that draw on the potential for ongoing and linked payments spurred on by connected technology. This potential trend emphasises how important it is for banks and financial institutions to develop new business models and relationships with key service industries such as fleet providers and energy providers[20], as these companies can help drive additional (and ongoing) revenue streams.

The widespread adoption of autonomous cars could also radically reshape the insurance industry, by changing everything from accident trends to questions of liability. Warren Buffett has predicted that self-driving cars could radically reduce the need for insurance by making accidents less likely.[21] But if an accident does occur, who would be liable? And how can insurers use the wealth of additional data that will become available from next-generation vehicles – both driven and driverless – to optimise insurance products and premiums?

We expect new insurance models will arise as insurers adapt to these new technologies, and change how they underwrite and sell insurance products (for instance moving from motor insurance to product liability insurance). These could in turn lead to profound changes. For example, if liability switches from drivers to software manufacturers, will it become redundant to consider individual motorists' driving skills?

Key Industry players are already working to bring insurance arrangements into the autonomous vehicle era. In the United States, insurer State Farm is already examining ways to develop ongoing revenue streams in an era of autonomous vehicles. As evidence of this, State Farm has partnered with Ford and the University of Michigan in researching automated vehicles.[22]

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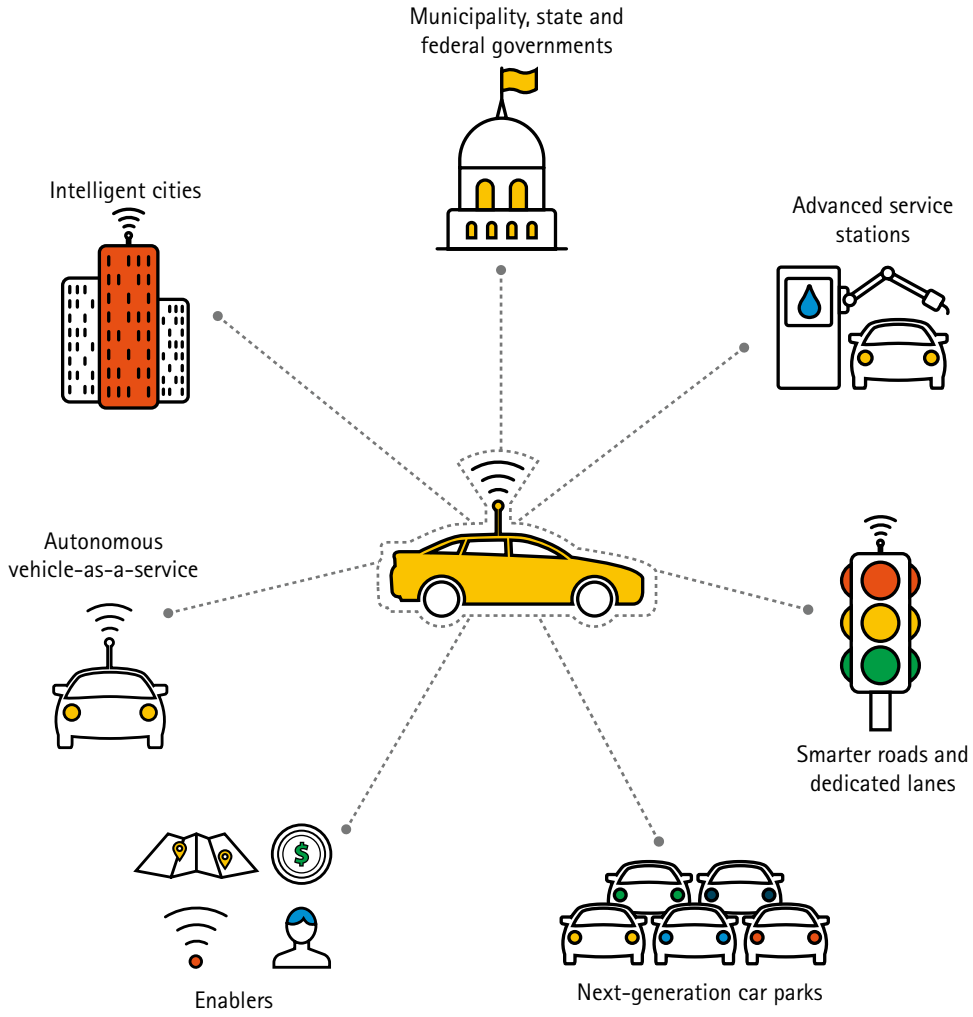
Figure 3: Autonomous vehicles will radically alter the way people interact with cars



Source: Accenture research

Governments and transport service providers

Will autonomous vehicles drive the development of modern cities? Could the whole road network become a usage based service?

Autonomous vehicles have the potential to improve city planning and underpin the creation of intelligent cities. These vehicles are constantly collecting road and traffic data, which local authorities could access and examine using sophisticated analytical tools. As a result, cities will have high-quality data to assist with urban network planning, and to develop new road revenue models based on the most up-to-date traffic flows.

Some cities are already using autonomous vehicle technology, in the form of smart sensors, to change the way they charge for road usage. Could authorities one day abandon individual vehicle registration in favour of making every road a toll road, while introducing real-time lane and capacity assignment?

To properly trial this technology, experts say that governments, businesses and organisations must work together to create the right test environment. "We're going to have to find an enlightened community that is willing to work with these companies, in this business ecosystem, and give it a try," Larry Burns says. "I'm not talking about giving it a try in an entire city, I'm saying find the centre of the city, put 1,000 of the vehicles in and let them begin to be used by people to kick off the learning cycle."

Mr Burns adds that regulators must also be on board, and all parties must ensure that the right data is being collected. "I believe once that happens, this thing can reach a tipping point and really take off," he says.

In the Australian state of New South Wales, the Centre for Road Safety is implementing Cooperative Intelligent Transport Systems which use smart technology to warn drivers about upcoming hazards and potential crashes. This is the largest initiative of its kind in Australia, and involves major transport operators.[23] Early results suggest that driverless vehicles could increase network capacity by 42%. Cooperative vehicles receiving and transmitting information to smart traffic signals could potentially save up to 15% in fuel consumption."[24]

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Governments and transport service providers (cont.)

In our view, through the operation of autonomous vehicles, the entire road network could become a service. That is, with self-driving cars, we could see the emergence of the car-as-a-service, where people can request to use a vehicle at any time without the need to engage existing car owners, or even public transport providers (see Figure 4). At present, even without autonomous vehicles, car owners are renting out their idle cars to make extra money; in the future, there may be no need to interact with vehicle owners to access a car.[25]

A change in the ownership and use of cars also disrupts current car parking models. The emergence of a car-as-a-service indicates commuters will favour a pick and drop off service which will reduce the need for multiple parking options; multiplex, on street and in residential premises.

Adding autonomous vehicles to this equation, cities could work to reduce the number of cars on the road by grouping together commuters travelling on similar routes.

Finally, transport authorities could use the data collected by autonomous vehicles to schedule vehicle movements at off-peak times, enhancing productivity and traffic throughput. This could extend to deliveries operated by mail service providers, supermarkets and retailers, where services could be scheduled to ease congestion and improve delivery times.

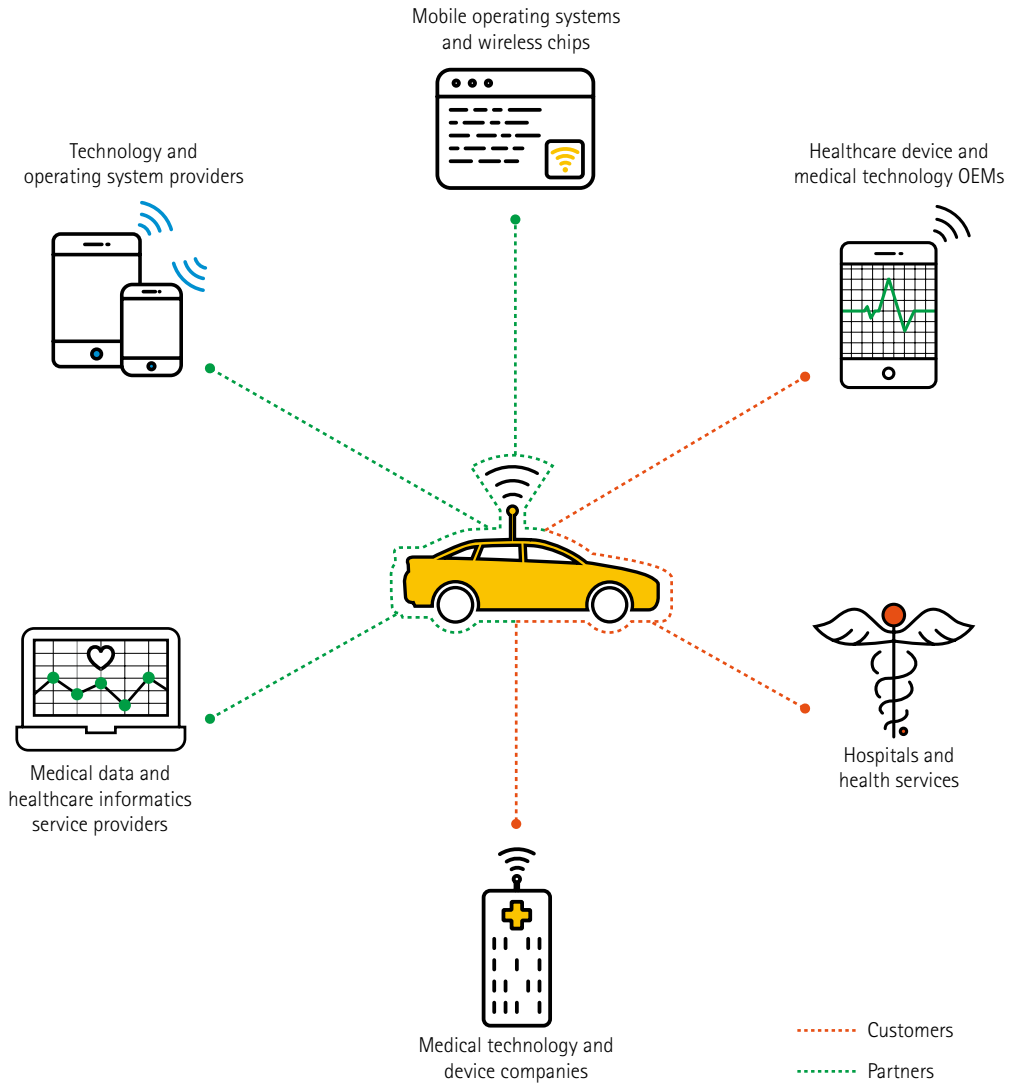
Healthcare providers

What if ambulances could predict where accidents were likely to happen and redirect traffic to get there faster?

The mass adoption of autonomous vehicles could have a huge impact on first responders (see Figure 4). With access to driverless vehicles, emergency services could collaborate with analytics providers to improve response times and elevate the level of healthcare provided to residents while potentially lowering costs.

Furthermore, by understanding trends in data, autonomous ambulances could be deployed to areas where there is a greater chance of emergencies occurring. Self-driving ambulances would allow paramedics to focus on treating patients. Meanwhile, the vehicle, with the help of an intelligent road network, would gain priority and use just-in-time 'dedicated' lanes to reach the nearest hospital in the shortest possible time.

Figure 4: How autonomous vehicles affect the healthcare ecosystem



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Roadblocks to the autonomous vehicle era

The autonomous vehicle era – involving both driverless cars and a massive increase in the intelligence of our road systems – promises profound safety and environmental benefits combined with opportunities for those organisations with the vision to realise them. However, there are at least four challenges that may act as roadblocks to the autonomous vehicle era.

Standards

There is currently no common and open platform. Around the world, the absence of common standards in autonomous vehicles is restricting software companies' ability to develop new capabilities. The industry needs a universal standard upon which to build self-driving vehicles equipped with compelling content and apps. By way of comparison, in the 1980s we saw a standardisation in fleet-tracking technology, which accelerated the adoption of these devices and improved road safety and efficiency.

Driver concerns

Drivers have concerns about the use of autonomous vehicles. According to a University of Michigan study in 2014, 68 per cent of Australian consumers surveyed were at least slightly interested in owning a driverless car; however, 57 per cent of respondents had concerns about safety, system failures and reliability.[26]

In addition, studies have shown that up to two-thirds of motorists enjoy driving so much that they are reluctant to give up control to autonomous vehicles.[27] This creates the added complexity of having to manage communication between – and simultaneous regulation of – autonomous and human-driven vehicles on the road.

Consumers' rights

The issue here is two-fold. Who owns the information these vehicles collect? And who has the rights on how this information is used? If you owned an autonomous vehicle that knew your daily driving routine, you could opt in and opt out of services, and have complete control over the information you share and how it is used. However, if you leased a vehicle from the central system, you would have less control over how the data was used. The system operator could push services and offers from service providers to the consumer, presenting challenges and opportunities pertaining to consumer rights, data privacy and security.

Regulation

At present, there are vastly different regulations governing the use of autonomous vehicles around the world. While parts of the United States (such as California) have introduced rules and the United Kingdom expects to have done so by early 2015, Australia has no such plans.[28] This may change in the near future, but there is a risk that conflicting regulations could pose substantial challenges for companies working on autonomous vehicles.

While significant, these challenges should not stop Australian companies from exploring the business opportunities afforded by autonomous vehicles by putting strategies in place now. With major global businesses and other nations actively pursuing this technology, it is likely to become a significant phenomenon in Australia within a decade. Those organisations that aren't prepared will find themselves being disrupted, rather than driving the disruption.

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The need for collaboration

To help build and take advantage of an integrated autonomous vehicle platform, Australian companies have a range of options at their disposal. These are listed in Figure 5, in line with the seven major industry groups we have focused on in this report.

Accenture Digital believes that the wider uptake of autonomous vehicles will create a ripple effect across the sectors listed in Figure 5. For example, new forms and volumes of digital content will change users' day-to-day data consumption patterns. This presents an opportunity for mobile carriers to upgrade their networks, boosting coverage areas and accelerating wireless speeds. At the same time, government agencies may need to develop regulations and other compliance standards to protect passengers from privacy violations.

As discussed, autonomous vehicles offer a unique opportunity for Australia's insurance industry. Insurers have the chance to use the data collected by next-generation vehicles to develop new insurance products – and potentially new revenue streams. However, to achieve this outcome, insurers will need to collaborate with vendors that specialise in analytics, cloud technologies, hardware and software.

For their part, technology providers will need to balance the benefits of developing new software, sensors and open interfaces with the need to protect privacy, maintain quality assurance across upgrades, and provide consistent, high-quality services to customers.

There is also a need for extensive collaboration if Australia is to create the right environment for autonomous vehicles. Aside from responses within individual sectors, governments, companies and organisations need to extensively collaborate to build the right platform – an open and connected ecosystem – if they are to drive the adoption of autonomous vehicles.[29]

The priority in this process is developing and endorsing open standards that are available to all partners, which in turn could develop relevant products and services that engage consumers. The leaders in this process should be enterprises that have the most to gain (and potentially lose), particularly car makers and ancillary businesses.

Accenture Digital believes that the wider uptake of autonomous vehicles will create a ripple effect across the sectors listed in Figure 5. For example, new forms and volumes of digital content will change users' day-to-day data consumption patterns.

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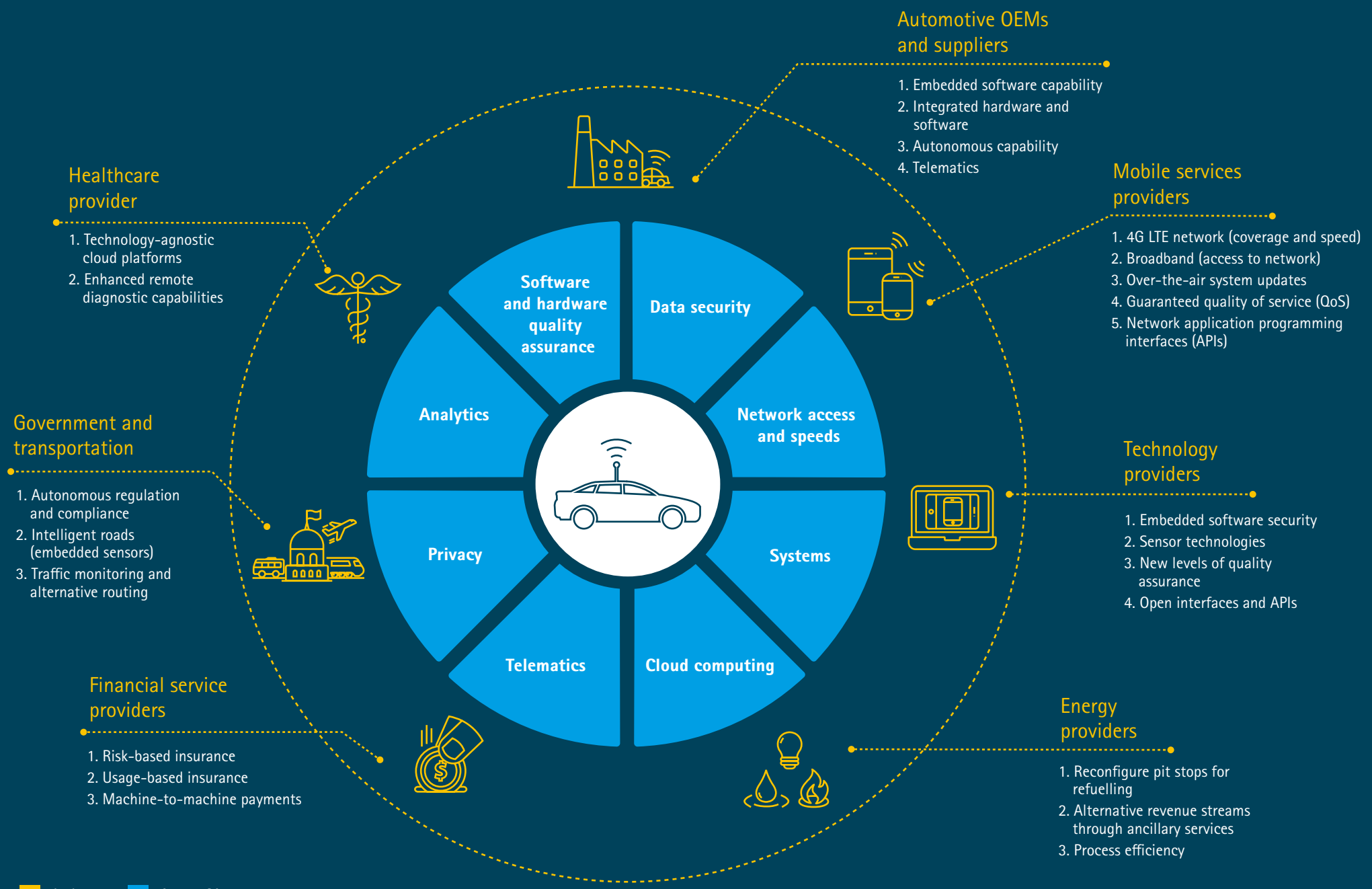
Figure 5: Capabilities required by Australian companies to recognise the opportunities presented by the autonomous vehicle ecosystem



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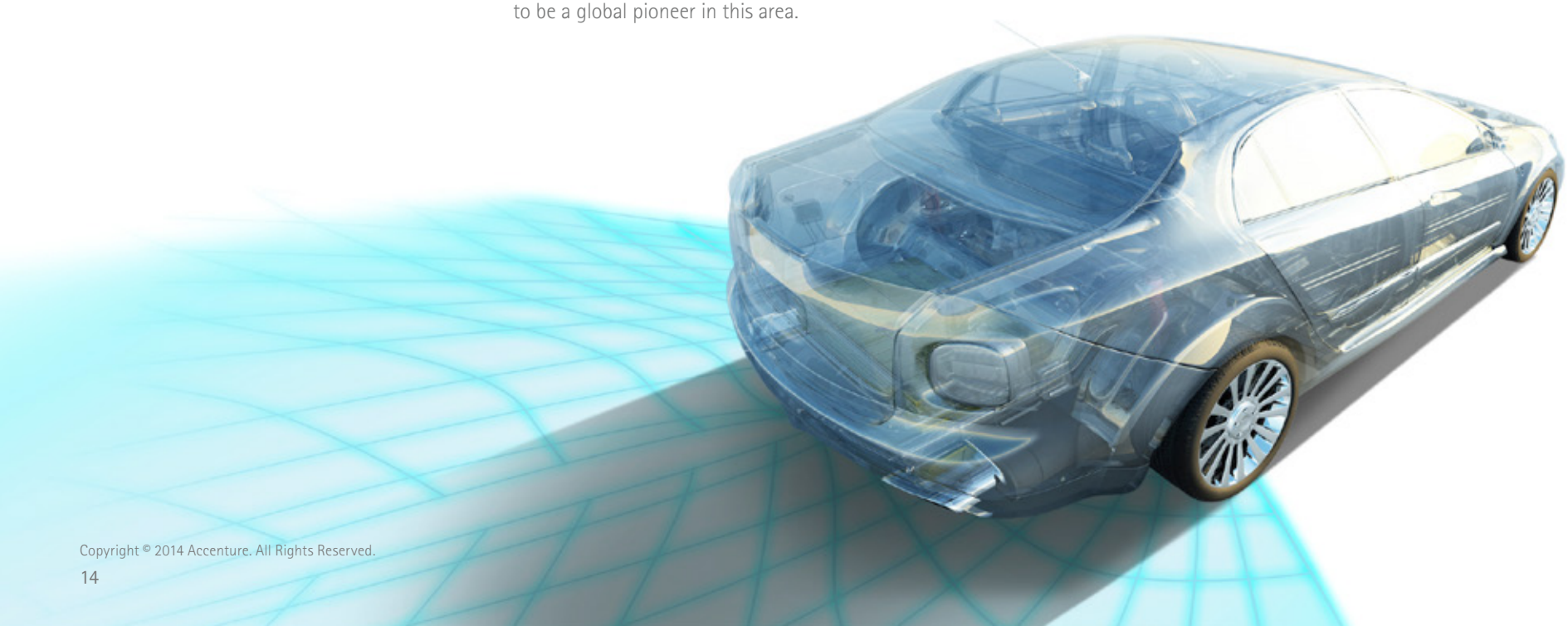
Conclusion

No longer a science fiction vision, autonomous vehicles are already being actively used in industries such as mining and are expected to become a mainstream consumer phenomenon in Australia within a decade.

However, to make room for this invention, Australia needs to create an open and connected environment. Such a setting should welcome and accommodate innovative self-driving cars and other forms of advanced transport.

Autonomous vehicles have profound implications for businesses in a range of sectors in Australia, from vehicle and parts manufacturers and telecommunication providers to transport groups, energy companies and financial services players. The good news is that with its low density, advanced technology and track record of innovation, Australia is well positioned to be a global pioneer in this area.

In our view, no one sector could single-handedly deliver or profit from autonomous vehicles. Instead, the key will lie in collaboration, strategic partnerships, industry leadership and government support. With the uptake of this technology already gathering pace around the world, it's time to act.



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"Cooperative vehicles receiving and transmitting information to smart traffic signals could potentially save up to 15% in fuel consumption." John Wall, Centre for Road Safety, Transport for NSW

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About the research

To understand the challenges and opportunities presented by autonomous vehicles, Accenture Research interviewed Larry Burns, former Corporate Vice President of Research and Development at General Motors, and numerous Accenture subject-matter experts in the areas of autonomous vehicles and connected cars. In addition, the research team used crowdsourcing from Accenture employees in Australia and New Zealand to gather ideas that shaped our vision.

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