

Preparing for our automated and driverless future

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Discussion Paper – National Summit on scope of automated vehicles

Introduction

Automated vehicles are expected to spark imminent and significant social, environmental and economic change, and as a result, the rights and responsibilities of the key stakeholders, such as vehicle manufacturers, infrastructure providers, insurers, road users and enforcement agencies, who operate as part of the current national land transport system, will alter substantially.

Setting national ground rules by which we will all function, as providers and users of automated road and transport infrastructure services, is critical to ensure a safe and efficient system for Australia.

The Uber experience has taught us that new business models will continue to emerge at a fast pace, and that retrospective action to regulate new types of mobility services is not ideal.

Therefore, we must develop a system that can evolve seamlessly into and beyond the driverless world. We must make our expectations and requirements clear before the new players roll out their technology and enter the marketplace.

National co-ordination is essential

During RA's January Board Workshop, Federal, State and Territory Governments identified a pressing need to investigate how to plan, co-ordinate and manage the roll-out of automated and driverless technology across Australia.

Under safety-first principles, it is vital that the co-ordination and sharing of information for on-road trials, use and re-use of data, retrofitting and streamlining existing transport systems and processes and the consistent definition of standards and rules to accommodate automated vehicles is managed nationally to ensure a seamless customer experience for all users of road and transport services.

Impending change in our infrastructure and workforce

Most observers expect that it may be twenty or thirty years before we reach the fully driverless age.

In the meantime we shall be in transition through various stages of connection and automation. However there is general agreement that a truly driverless world is a realistic expectation. And if that world is only a generation away, it is important to understand where these developments are leading.

If cars drive themselves, many existing systems and institutions will simply become redundant.

A few examples:

- No signage or road marking
- No traffic lights
- No crash barriers
- No drink driving laws
- No police enforcing speed limits
- No need for safety systems in cars
- No parking meters – no parking spaces!
- No driving licences
- No taxis (or Ubers)

The entire discipline of traffic management and a wide range of professional skills will become less relevant. We will have little need for many academic and management skills which have so long been part of our society.

There will be important effects on road infrastructure and freight. Driverless cars will need less space. The design of roads will change. Congestion should be significantly reduced. The opportunities for driverless freight corridors are enormous.

There may be major implications for car manufacturing. Cars may not resemble the cars we know now. They can be made of composite materials with tiny motors. Since traffic will be managed by computers, drivers of the future will not even be able to control their acceleration. Cars may also be made by a completely new set of manufacturers – including people who are making mobile phones now.

By simply listing some of these possible impacts for our workforce and infrastructure, it should be apparent that Australia faces profound change – even during the period that connected and semi-autonomous vehicles are evolving in the immediate future. It is tantalising to speculate on how far the ripples may spread.

At face value the coming of a driverless age is about the ease with which people drive. But unless we look beyond that, we may miss the most important dimension of change.

Private Vehicle ownership

The most important feature of a driverless car may be that it should remove the need to own a car.

Consumers will be able to call up cars on their mobiles. Their cars will come to them. That has the potential to transform transport as we know it.

The car fleet can be used 24/7 - used and re-used. Travel should be cheap and convenient. When they are not on the road, these driverless cars can be stored in large low cost distribution centres. Society should need fewer cars.

All of this provides the opportunity for fleets of driverless cars to be operated by a small number of major operators.

If private ownership of cars declines or disappears this is a serious, and perhaps catastrophic, threat to traditional car manufacturers. It would also have implications for Australia's motoring clubs, our insurance industry, the operators of major commercial car parks, the operators of our existing motorways, and the taxi industry, among others.

The motor car is an embedded technology. It is hard to imagine life without it. It has been so critical to our society for 100 years that the design of our cities, the subjects we study at university, and the ways we earn our living are all mixed up with it. In fact our society is imbued with assumptions about the continued use of cars.

The Transition

The transition to automated and driverless cars will not necessarily be seamless. Within the industry, highly automated vehicles and driverless vehicles involve somewhat different visions. The former are likely to be advanced versions of our current vehicles with the driver still responsible, while the latter will operate independently of the passenger with computerised point to point traffic management.

Although this paper focusses mainly on the ultimate outcome which involves driverless vehicles, this will not be achieved overnight. The technological and infrastructural challenges simply in managing the introduction of transitional automated vehicles are considerable – and early versions of these vehicles are on the immediate horizon.

It would therefore be a mistake to suppose that we only need to look at the end game. Managing the transitional vehicles is just as important. And the arguments advanced in this paper in relation to the need for national co-ordination and standards hold equally true for every stage of the roll-out.

In the meantime the interested parties are jostling with a variety of preferred scenarios which reflect where they would each like to be in future.

At industry conferences there is a noticeable division between the “evolutionaries” and the “revolutionaries”. The evolutionaries speak about how cars will progress through various stages of connectivity, using existing roads which will adapt as needs change. These cars are the highly automated vehicles now being developed by the established car makers. These manufacturers typically discuss the evolving technology as though it is an accessory – an enhancement in an everlasting production line. Rarely, if ever, do they speculate that private car ownership may be called into question.

For the most part, the revolutionaries are not even present at industry conferences – perhaps because they plan to by-pass the others. However, like the evolutionaries, they seldom mention private ownership. Certainly, the revolutionaries have no interest in preserving it. However, they may have their reasons for directing attention to the technical challenges rather than their business plans in owning fleets of driverless cars.

The expertise generally available to our policy makers also emphasises the technological aspects. Road agencies throughout the world are staffed by engineers. Their natural focus is how to make transport technology work rather than the commercial business models for cars of the future.

The upshot is that declining private ownership is the elephant in the room. Its commercial implications are largely omitted from the conversation – but for different reasons. Although presentations about driverless vehicles abound in TED talks and the internet, there is remarkably little to be found about how vehicles may be owned or their possible business models. Industry meetings on automated and driverless vehicles invariably focus on the technology rather than its implications.

Australia may have some work to do for preparing to manage the roll-out, but we are not alone in missing the full implications of the emerging technology.

On 14 April this year the members countries of the EU showed how advanced they are in preparing to co-ordinate the technological implementation of automated/driverless systems.

The Declaration of Amsterdam committed the signatories “to actively participate in developing the European strategy and agenda on connected and automated driving”.

Through pages of detail the document discusses what the member countries need to do to co-ordinate and implement the roll out. But not once does the document mention that driverless technology will change the system fundamentally as car ownership moves from private motorists to fleet operators.

In the United States there appears to be a higher level of awareness. Although American administrations may not usually be expected to stand between Silicone Valley and their new products, there is an additional factor to be considered – the USA relies heavily on a fuel tax to fund its roads. Somehow this revenue needs to be built into the future mix.

CHALLENGE NUMBER ONE

Driverless cars challenge many of our assumptions about public transport.

The challenge facing industry and policy makers is not simply the end of cars as we know them before the end of the century. Fleets of driverless cars will also test the value of existing public transport.

Access to a car should be much cheaper than it is now:

- The cars themselves will be much cheaper to build – small, made of plastic, no secondary safety equipment
- The full value of the car can be captured in usage. Users will only pay for the fraction of time that they use the car.
- The car will use much less road space and the infrastructure requirements will be much simpler – we will enjoy much more efficient infrastructure

In combination these cost advantages over existing public transport are very significant.

Driverless vehicles will also take their passengers point to point, delivering them directly to where they want to go. No other public transport does this. This is a potential game changer.

So, if driverless transport is cheaper, turns up at the door at a time of your own choosing and takes you directly to your ultimate destination, it will have irresistible advantages over many current public transport options.

Rail will probably continue to play a vital role for freight and longer distance commutes. But when we think of public transport in future we may come to think firstly of driverless cars.

So what is really at issue here is not a change in private transport. It is actually a change in public transport. This is a revolution which may make public transport the preferred solution for private motorists.

It may even confuse the issue to think about these new vehicles as “cars”. As soon as we do so, we carry over old assumptions about ownership. If we think of these vehicles as a new public transport system, we may be on the right track.

CHALLENGE NUMBER TWO

Driverless cars will challenge many of our assumptions about cities

The automation and different infrastructural needs of driverless vehicles will have a range of outcomes for the grid patterns of our streets and other aspects of urban design.

But driverless vehicles may also call into question some articles of faith. Current wisdom has it that our cities must now cluster in residential hubs. Only then can they afford the expensive mass transit systems we expect they will need. Everyone must all live above the subway.

Meanwhile, people who live on the city fringe often have poor public transport. They must use their cars at high cost and face impossible congestion. The city fringes have become the residential areas for battlers with property values to match.

The driverless car may mitigate this. It will be a cheap point to point public transport system for urban commuters. There are, of course, other services and considerations which impel us towards densification. Driverless vehicles will not obviate them. Nonetheless, driverless cars may reduce some of the significant incentives to live in the city.

Fleets of driverless cars will make a big difference to rural communities. Rural communities cannot afford heavy public transport systems. Access to schools, hospitals and work is a major disadvantage. But driverless vehicles will give them the public transport that will change their lives. They may have their cake and eat it too. It may unlock the public benefit of living in the country.

With driverless cars on the horizon, planners may need to revisit some of the thinking about how communities are designed, especially whether densification is a necessary pre-condition for transport efficiency.

CHALLENGE NUMBER THREE

Who controls the network?

We should not assume that the new networks will be managed by government agencies as they are now.

As the driverless revolution unfolds, it will challenge assumptions about who manages the transport network. Already private players are positioning themselves to be the network owners and operators of the future. These players plan to manage the network with computers, not traffic managers.

We should not expect the new players to ask permission to roll out their solutions. The guiding light of disruptive technology is to by-pass existing institutions. By-passing the resident gatekeeper is not just the new players' standard practice – they see it as their secret of success.

Two examples:

- No-one consulted Australia Post before emails appeared. Yet emails have largely replaced the postal service. Australia Post did not see what was coming. Perhaps they should have amended the postal act to define an email as a letter and charged one cent for each transaction - and captured value for the community.
- When IBM and others connected their computers using Telstra's wires, the existing network was the indispensable element in rolling out the internet. No-one saw it. Telstra did not even charge them for using the wires even though a new commodity had been introduced.

There is a strong possibility that the road networks may be seen the same way – uncontested open space.

There is also a great deal at stake.

Since ancient times all road networks around the world have comprised three elements, each controlled by distinct groups of stakeholders:

- The roads – mostly owned by governments
- The vehicles – owned by lots of individual people
- The journeys – individuals travelled as they pleased

Throughout history the value of the journeys has been captured privately by the individual owners of the vehicles. But in a driverless world the vehicles may be owned by a handful of mega companies. And they will be able to charge the others to make their journeys. In such a world, the player who owns the vehicles and the computer takes the prize.

The driverless car potentially opens up more earning power than almost any commodity imaginable. The individual journeys will be as numerous as emails, but they will attract a much higher return.

It has been estimated by RMS that every day in Sydney there are 16 million journeys. Apart from people who use public transport and taxis, the value of those journeys is not captured by anyone. If we assumed Sydney's journeys are worth merely \$10 each, we are talking about over \$1billion per week in Sydney alone. This value is a new commercial commodity unique in history.

The community is entitled to a share, if for no other reason than that the land and the infrastructure are publicly owned. The community's entitlement might be achieved through partnership, ownership, taxation, licensing or some other mechanism. This income could provide the hospitals and schools of the future. And, like the internet and the Telstra wires, the new commodity cannot be achieved without using existing networks.

However, in the roll out, three things are critically important:

- As we develop our approaches to road user charging **we must develop a system which can evolve seamlessly into the driverless world.** It needs to be adaptable because we do not want to start again. In short, we need to design for the driverless age right now. It is ironic that, while this is in prospect, we are still worrying about how we can find a replacement for fuel excise on the vehicles we are driving now.
- **We need to lay down our ground rules before the driverless cars hit the road.** The Uber experience, the internet and the emails should all teach us that we cannot set the rules retrospectively. We must make our expectations and requirements clear before the new players roll out their technology and business models.
- The issue here is not primarily about facilitating the technological roll out. The emerging players would be only too pleased if we focussed on that. **The heart of the matter is understanding the value chain and how it will be captured.** This has profound implications for the skill sets of the people who work with our treasuries and transport agencies.

The disrupters may say that their business models are not new products, but simply natural extensions – unrelated to the public infrastructure. But if the goal posts move far enough, a new game begins.

It is also important to recognise that the likely business intention of the emerging players is not simply to replace cars with driverless fleets. The contested space includes the networks themselves and perhaps their administrations as well.

A new public transport system for both passengers and freight is on the horizon. There is no reason to suppose that, as this evolves, government should simply withdraw from owning public transport on behalf of the community. Yet it is widely assumed by the disrupters that this is naturally a new private sector domain. We need to encourage the new entrants but also make it clear that our existing networks are not terra nullius. Governments may very well decide to operate, or at least own, the new networks.

CHALLENGE NUMBER FOUR

Are we ready to manage the roll out?

As a nation we are not well placed to manage all this. It is so much bigger than our community currently imagines.

The community, political leaders and policy makers are mostly only dimly aware, if at all, of the speed and implications of what lies ahead.

Our road and transport agencies are staffed by people who are overwhelmingly educated and expert in the outgoing technology. Moreover, they are geared to deliver infrastructure and technology – not to capture commercial value from their assets. To address the emerging challenges, our transport agencies and planners will need to understand and anticipate the commercial issues.

In short, we have no national mechanism to plan, evaluate, co-ordinate, approve and manage what is going to happen on our networks both in the transitional and driverless stages. This is not simply a matter of regulation; it is more about understanding the business models of the emerging technology, thereby representing the public engagement.

There is also an enormous challenge in reviewing legislation and regulation. Our existing rules were not written with this new future in mind. Many of the rules are inappropriate or simply blind to what is about to occur.

Our task is also complicated by other technologies which will emerge in the same time frame. Big data is just one of them. The advances in automated technology cannot be considered in isolation and may be affected markedly by other technologies yet to be seen.

In responding to this challenge it would pay not to be overly territorial. Although policy makers will wish to protect the public interest, it would be wise to engage the new players as partners, not competitors.

The appropriate course might be to lay down the ground rules, invite their engagement, and negotiate arrangements which will deliver transport efficiency and economic returns to the community. In this process the emerging players are not necessarily antagonists.

CHALLENGE NUMBER FIVE

How much time do we have?

History suggests that self-evident value is adopted very quickly.

- The first international airline began commercial flights in 1919, only 16 years after the Wright Brothers showed that people really could fly.
- The first mass-produced Ford came off the assembly line in 1913. By 1927, 15 million Model T's had been manufactured.
- And the world's first mobile phone was made 40 years ago. Now mobile phones exceed the population of the world.
- Since then the take up time for new technology has become shorter and shorter. In almost every case the take up time is vastly shorter than expected.

There is even a possibility that driverless technology will begin solving many of our current transport problems before we untangle the problems of the present system.

Perhaps we will still be trying to manage congestion when driverless technology simply sweeps most of it away. We may still be worrying about drink drivers, speeding, and hospital beds when driverless cars do away with road accidents.

Summit Outcome

It is not expected that this summit will make decisions about how all this is to be delivered. Its agenda is much simpler – to promote the realisation that the change ahead of us is imminent, massive and demands a single national approach which extends into state and local government in ways we have seldom seen before.

Hopefully this will encourage policy makers and stakeholders to address how to manage one of the most important challenges facing Australia before the end of this century.

Conclusion

In conclusion, Roads Australia encourages the national co-ordination of the roll-out and management of automated and driverless vehicles.

There is broad recognition that national co-ordination is essential to be able to effectively protect the public interest, and to capture the best possible advantages from this unique opportunity for the Australia economy, both during and after the transition to an automated and driverless future.

It is our hope that governments, at all levels, will work in unison with all key stakeholders, to realise these benefits for present and future generations with a great sense of national purpose.

Further useful reading includes a discussion paper developed by the National Transport Commission: [http://www.ntc.gov.au/Media/Reports/\(049B1ED1-5761-44D5-9E3C-814A9195285D\).pdf](http://www.ntc.gov.au/Media/Reports/(049B1ED1-5761-44D5-9E3C-814A9195285D).pdf)