

Driverless vehicles and social implications on the transportation industry

Submission by the Bus Industry Confederation



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Bus Australia Network



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About the Bus Industry Confederation of Australia

The Bus Industry Confederation (BIC) is the peak national body representing the interests of Australian bus and coach operators and suppliers to the industry. As the primary voice of the bus and coach industry the BIC works with all levels of Government, regulatory authorities, strategic partners, the passenger transport industry and the community to:

- Encourage investment in public transport infrastructure and services;
- Coordinate and make more effective existing Federal, State and Local Government policies and programs that relate to passenger transport;
- Improve public understanding of the contribution made by the bus and coach industry to Australia's economy, society and environment;
- Ensure that the accessibility and mobility needs of Australians are met, regardless of where they live or their circumstances;
- Ensure that buses and coaches operate safely and effectively.

Context

Ever since the automobile frightened the living day lights out of horse and cart, we have not seen an evolution in transport technology that will have a major impact on humanity and society at large. This was until the autonomous vehicle came along. Initially the public perception of this innovation was that it was a technological novelty. In an advanced society such as Australia, vehicles such as cars are essential for daily commute and business operations. We are witnessing a technological evolution occurring where the humble car can now be operated without the need for a driver to control the vehicle's movement. Technological advances are also being applied to heavier vehicles such as trucks and buses. The BIC would note however that the concept of a driverless bus, in particular large buses, may be technologically possible but the reality of mass transit and school bus services operating in this way are much less certain for a variety of operational and personal safety and societal issues. The unknown element from a bus perspective is if it is going to be accepted by users concerned about safety and security. Measures to gain the trust of the community in relation to safety and security will be very important, but ultimately they may not be successful. This issues has the potential to block the use of driverless buses and may limit the technology to personal conveyances and may even restrict them. These issues are dealt with later in this submission. It should be remembered that driverless trains have been a reality for some time but are manned by a driver in most, if not all instances and that despite fully functioning auto pilots on today's commercial jet fleets, pilots are still a reality.

In the US, a strong push for driverless vehicles has come from expectations of significantly improved travel safety with autonomous vehicles, with expectations of accident reductions of 80+%. If realized, this is an important social benefit.

Driverless vehicles also promise more effective use of scarce road space, through the ability to operate closer to surrounding vehicles. This should save public money in terms of the need to add road space, another societal benefit. It is most unlikely that this potential benefit is taken into account in evaluating major new road projects that are due for completion within a decade or so.

As suggested below, the benefits of such projects will thus be over-stated.

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Availability of a (driverless) vehicle of your choice, on-call, may be an attractive option for many people. The opportunity to work while travelling in your driverless car removes the notion of saving time having productive value, if you can work just as well in the car, as out.

As a consequence the time savings benefits attributed to many major new road projects are likely to be illusory – they will simply vanish! This compounds the errors in road project evaluation from ignoring the impact of driverless vehicles on effective road capacity.

Access to cheaper travel, where time saving has little value, in turn, may significantly reduce the pressures for workers to live close to where they work. Longer travel times lose disutility if the time can be productively enjoyed. Accelerated **urban sprawl** is a highly likely outcome, with all the adverse social consequences associated therewith. This is a major potential social risk from driverless vehicles.

Car sharing (where this is linked with driverless vehicles is hard to predict as the culture in Australia is one of car ownership) creates the possibility that access to driverless vehicles will be substantially less costly than owning your own vehicle, even if it means significant numbers of empty vehicles re-positioning themselves for their next task (using up some of the additional road space made possible by driverless vehicles!). This opportunity for **cheaper accessibility** is likely to be of benefit to some **transport disadvantaged people**, where the cause of disadvantage is a lack of financial capability. The associated dead-running, together with the likely impetus to accelerated urban sprawl from the introduction of driverless vehicles, underlines the vital importance of a proper **road pricing regime** accompanying the introduction of driverless vehicles. This will have the benefit of reducing the growth in demand for the absolute numbers of driverless vehicles, encouraging **sharing** at the margin rather than owning your own vehicle, and will reduce low value movement of such vehicles. A substantial increase in use of shared vehicles must be an important part of the introduction of driverless vehicles, to reduce the risks of sprawl and of growth in congestion (caused by use of cheaper, more accessible vehicles growing faster than the improvement in effective road capacity from driverless vehicles).

The role of mass transit, and in particular bus, whether they will be driverless or not must be considered in the future, for the same reasons these services are provided today and in the context of the outcomes such services deliver to the economy, environment and society. For example congestion management in a world of driverless cars and an increasing population will still need to be addressed and mass transit solutions will be part of this.

A road pricing regime that prices the full social costs of vehicle movement, full or empty, creates the opportunity to exercise more effective and efficient transport network management control over potentially serious adverse unintended outcomes, from greatly increased demand for limited road space and pressure for accelerated urban sprawl.

The reduced cost of private vehicle access that may accompany driverless vehicles may pose a **threat to public transport** but also provides some possible ways out. Removing labour costs from driverless taxi/Uber type services, for example, may increase demand for those services, some of which may come at the expense of public transport – although these services are increasingly becoming part of the ‘public transport’ mix. Similarly, increased personal travel in cheaper driverless shared cars may also reduce demand for PT trips. Such circumstances may reduce demand for some types of bus services as we know them today, and thus reduce mobility options for those at risk of social exclusion. The balance between providing services in driverless cars and small shared passenger vehicles that may be able to operate on a commercial basis and Government funded bus services today that subsidise passenger fares needs to be seriously considered in the context of social exclusion and access to opportunity. Driverless large mass transit buses may be less expensive to operate, and could allow for greater investment in more mass transit bus services. That is, if such large driverless vehicles will be accepted and used by the community.

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With labour costs accounting for half the costs of bus operation, driverless buses will have cost appeal to governments seeking ways to reduce costs of public transport service provision. Smaller driverless buses have the potential to improve local access opportunities at the social safety net level, since their lifecycle cost advantage creates the opportunity to add services (in smaller vehicles) for any given outlay on public transport, which aligns with the idea of mobility as a service (MaaS). Such lower costs of service provision thus create opportunities for extending services in areas that are currently under-provided or have no services at all, including through tailoring bus sizes more closely to expected demand patterns. This is a potentially significant benefit in terms of **social inclusion** opportunities, flowing from a convergence between public and private transport as we know them today.

The introduction of driverless vehicles should be seen as an opportunity to **review mobility** in general, reflecting on the whole mobility system, the purpose and value of mobility and how it can be accomplished better in social, environmental and economic terms, recognising the potential benefits and challenges associated with driverless vehicles.

This review should range widely to include such broad issues as how to better increase the opportunities for active travel, open up more safe locations for children's play (e.g. using parking space that becomes available if shared autonomous vehicles become the norm) and increase the mode share of 'public' transport. It also needs to identify pathways to move to zero carbon emissions. Consideration needs to be given to the impact on employment and jobs.

Within a review of the future of mobility, a core issue for consideration relating to driverless vehicles will be age/ability conditions on vehicle control. For example, should young and elderly people who don't have a licence now be permitted to use driverless cars? This indicates a trade-off between social inclusion and potential congestion. Will driverless vehicles become a valuable asset for those with a disability? If road pricing reform is introduced, including congestion charges, as we argue above, how will equity issues be resolved? Part of the solution to congestion may be the much wider introduction of small local buses, linking in with the 20 minute neighbourhood, (See BIC Policy Paper 4 <http://bic.asn.au/solutions-for-moving-people/bic-policies>).

There is a need to establish who is the 'person in control' in a driverless car should an incident happen. Thus, does the passenger need to remain 'in potential control' if needed to avoid a possible mishap? The insurance industry will, no doubt, be all over this challenge.

Points specific to the bus industry

Market segments

In simple terms, there are three main market segments for what is known as the public transport (bus) market.

Each of these services or market segments in some way operate with Government subsidising the passenger fare.

The impact of driverless vehicles in reducing operating costs and therefore providing a possibly more commercial basis of transit operations is explored further below. As far as the current discussion stands it seems little focus has been placed on capital and IT and technical costs to operate driverless vehicles which may well create significant costs above what is currently the case for mass, local and community transit services.

Mass transit services are high volume point-to-point services that operate through what will become increasingly significant strategic transit corridors, in which a substantial proportion of future population

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growth will locate, as our cities seek to become more compact (~half in Vancouver). These services are high frequency, volume-based services, which need to operate with good speed and high reliability. They are likely to grow substantially as urban densities increase and are least likely to lose market share to innovations such as Uber or driverless vehicles. These services in the BIC view are unlikely to be driverless or unattended.

Local transit services are about coverage and servicing the 20 minute neighbourhood. In effect local services operating off major trunk route services to deliver passengers closer to home or end destination.

Community transit services are about people who need assistance with their travel, for various reasons (e.g. a personal disability of some type, such as physical or intellectual).

- The local transit market segment, which is currently served by local buses, could be subject to competition from migrating services such as driverless Uber type multi-passenger services, who may see an opportunity to provide a service at a profit. The provision of existing subsidised local bus services, as we know them, may be reduced in this competitive environment, meaning that those least able to pay for a local PT service may be without service. Many people who use a bus service for local transport needs are those without cars (due to low income, age/disability etc.). It is possible (likely) that the cost of an Uber or taxi or shared driverless vehicle (bus) may be too high for those on lower incomes to be able to use the vehicle. In such situations it will be unfortunate if the public local bus service is abandoned or even further diminished than it is now. This is an area where social impacts could be considerable. From a regulatory perspective, this future market segment needs to ensure all potential providers meet decent safety and environmental standards;
- The community transit clients will be joined by those who drop out of the local transit market segment, leaving an expanded number of people who will need some form of local mobility to support their social inclusion.

Operating costs

At present the major operating cost of a bus is the wages of the driver (~half the costs of urban route bus service). If the bus has become 'driverless', there will still need to be some oversight of the bus on the road. In the mass transit market, this oversight will be to assure performance expectations are met.

In the local and community transit segments, it will be to ensure that the specialized service requirements are met. A level playing field oversight will be needed to ensure fair competition and service providers are capable of meeting specialised customer needs.

Buses operating with only passengers raise a number of concerns, which are outlined below. One factor that has been recognised after actual trials of driverless buses on guided busways in France is that passengers do have concerns of trust and safety when a driver is not aboard. In this example, drivers were returned to the bus to ease concern, despite the fact that the vehicle remained self-driven. The physical presence of the driver was an important psychological factor, even if it was only for "override" capabilities if required. Trusting future technology will be a major challenge for many individuals.

Capital costs

We are not aware of the expected capital cost of driverless buses. While a driverless car will cost the purchaser more – initially \$7,000 to \$10,000, but diminishing over time, the cost increase for larger vehicles can be expected to be larger. As mentioned above little information also seems to be available in relation to capital, IT and technical cost of operation. Also the driverless buses on trial tend to be much

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smaller than the common commercial bus. This is in line with our expected market categorizations above, which sees local transit travel as the possible main change area from driverless vehicle technology.

Driverless Buses from an Industrial Relations Perspective

This section of the submission is the product of consultation with the Australian Public Transport Industrial Association's (APTIA), the industrial arm of the BIC. It can be fairly assumed as outlined above in relation to bus market segments, that some public transport networks may initially encompass both driverless and manned services. It is not possible to get a clear picture as to what a driverless bus system would look like in the short term. However with trials of small driverless buses already being conducted by some Governments in Australia, it seems that a driverless bus system is being looked at to take the form of a network capable of providing door to door on demand services operating in the local transit and community transit services market segments. As an emerging market that has been largely led by companies like Uber and Lyft, the long term employment impacts on the bus industry would probably be minimal, and possibly may involve increased employment (not drivers) if bus companies decided to compete in this part of the MaaS market.

The introduction of driverless buses in the Mass Transit Trunk Services segment if accepted by the community will cause a reduction in the existing driver work force. The transition to new driverless technology will need to be managed in a way that provides for an ageing workforce to be naturally retired from the workforce or retrained to take on new roles that will emerge. Drivers may become attendants on the bus for example.

As mentioned above any transition to new driverless technology and in effect a possible new transit marketplace needs to be considered in the context of an Industry that has an aged workforce and retraining for new jobs.

It is reasonable to assume that a company should take the responsibility to retrain their employees if they were taken out of their usual role.

The issues here are:

Older employees may find it hard to retrain for a different profession if they have been in a certain job for 20 years plus;

1. They might feel that they are too old to learn something new;
2. They feel that they might not be able to understand new concepts and might not be able to do certain tasks due to physical exertion;
3. Job opportunities in short supply versus high demand for 'stable' employment;
4. Stable means full/part time but most importantly it must be permanent;
5. Casual or seasonal work is not an option if people have a family to support;
6. Age discrimination is also a factor. It is easy to say that a mature jobseeker needs to transition into different industries, but the reality is that some industry sectors do not view older jobseekers as a viable option;
7. Mental health challenges as a result of job loss or redundancy.

It is hard to imagine that mass transit buses and dedicated school buses would ever be driverless. The same would apply for special school services where student are in need of carer support. Safety and duty

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of care would at a minimum need to ensure that a driverless bus was manned by a support person in this instance.

In summary APTIA raises its concern about who will bear the cost of a possibly reduced driving work force and the retraining, relocation and severance if a driverless vehicle world becomes a reality.

Road Safety

Driverless cars and small buses are already being tested but the application of driverless technology to public transportation is a completely different challenge. There is no guarantee the public will warm to this innovation and entrust their safety and the lives of their loved ones when boarding a driverless public transportation vehicle.

Road safety and accidents in the context of operating in mixed traffic (driverless and manned) or a fully autonomous environment are unknowns and will no doubt occur. The psychological reality for a human to implicitly trust a machine to ensure their own safety on mass transit without a physical presence to control the vehicle, even if only in the event of an emergency, could be a major barrier for the uptake of such technology for buses.

Personal Security

Although technology has improved our lives in various ways, often we are left frustrated by its flaws. In vehicles laden with technologies, even with a human operator at the controls, technology companies have successfully conducted tests by hacking into a car's computing system to take over the control of the vehicle from the driver. Can the operating system of a driverless bus be hacked?

Issues of personal security and national security are of major concern in modern political and geopolitical terms. What measures will be available to protect passenger safety on driverless mass transit vehicles? This question is based upon the assumption that autonomous vehicles will run on a uniform operating system platform.

Personal safety on the vehicle

With a driver in all vehicles as exists today, personal safety is an issue in a car (road rage) and on a bus. Without a driver, the risk on a driverless bus in relation to child abuse, bullying, offensive behaviour, theft, graffiti and vehicle damage must be greater. It is also unclear how a personal emergency will be managed, such as a heart attack, panic attack etc. The perception of safety on public transport is a current issue of concern with the public.

Personal safety off the vehicle

The public needs to be reassured that they are as safe as pedestrians and drivers of other vehicles, when in close proximity to driverless vehicles.

Personal Autonomy

A much forgotten aspect of the driverless vehicles discussion has been the personal autonomy aspect of car travel that humans have enjoyed since the invention of the car and their own personal attachment to driving and to the car itself. The homogenous approach to driverless mobility does conger a somewhat drab world.

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Physical access

It is unclear who will offer additional assistance for people with difficulties accessing the vehicle due to personal disability, age, or prams/strollers for young children. This may mean that in some cases a person with a disability may need a support carer to travel with them, resulting in a significant loss of independence. This is central to the requirements for the 'financially non-viable' segment.

Conclusions

Finally, we suggest that driverless vehicles are a long way off yet – both in terms of technology and establishing the environment for them to run.

Initially the following questions need to be answered before further development occurs to ensure the personal safety and security of individuals on buses and that physical access and opportunities are not reduced:

- How do we establish a moral decision about how to respond to an impending accident – e.g. save the passenger or save the pedestrians who will be hit?
- How will the driverless vehicle operate in very poor visibility e.g. dense fog and snow?
- Will the car's cameras correctly interpret a view of a pothole, puddle, oil spill and shadows?
- Maps are needed with considerably more detail than is presently available, such as traffic signs, and roadworks. Such maps will need continual up-dating.
- What will be the impact on road congestion of a fleet of driverless vehicles?
- How would incidents of criminal behaviour be managed?

In summary, the move to driverless vehicles needs to be understood in association with other transport changes taking place, such as shared vehicles and road pricing reform. These matters must be treated in an integrated way, in the context of the broader societal trends and issues that have to be addressed – road safety, personal safety and security, national security, social inclusion, population growth, urban sprawl, possible job losses with technology, climate change and the need to address greenhouse gasses and traffic congestion.

There is an opportunity to use driverless vehicles as a stimulus to review how mobility in urban and regional settings should be addressed, with policy, regulations and planning put in place to better link land use and transport in this changing technological setting. A first step however needs to be a thorough analysis and future real world trials of where autonomous vehicles and what types of autonomous vehicles will be accepted by the community for use.

We appreciate that the role of Government is to try and find a delicate balance between addressing the challenges that this technology poses not just for legislation and regulations, together with the social implications, but also to be seen not to be standing in the way of innovation. The mining industry already uses driverless technology in their trucks and is apparently successful in their endeavours. However, we note that the trucks used in mines do not carry passengers in an urban setting.

We have witnessed technology impacting the taxi industry. There it has been proposed that the creation of ride sharing technology does not mean job losses for the taxi industry but has forced them to be competitive. The impact of technology cannot be said to have the same effect on the heavy vehicle industry, which is responsible, not only for public safety but also transportation of people and goods in a safe and reliable manner.

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