Autonomous vehicles: potential impacts on travel behaviour and our industry

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This presentation considers the potential impacts of autonomous vehicles and opportunities for the bus industry

1. What is an autonomous vehicle?
2. Potential impacts on travel behaviour
3. Opportunities through driverless buses
4. Summary
An autonomous vehicle is one that can drive itself to a predefined destination using various sensors & technologies.

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<th>Definition</th>
<th>Travel behaviour impacts</th>
<th>Driverless buses</th>
<th>Summary</th>
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<td>An autonomous vehicle is one that can drive itself to a predefined destination using various sensors &amp; technologies.</td>
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While autonomous vehicles are expected to be on the market by 2020, common use isn’t expected until almost 2030…

...with some suggesting we are currently at the ‘peak of inflated expectations’ when it comes to autonomous vehicles.

Source: http://www.gartner.com/newsroom/id/3114217
We therefore need to be realistic:

“Ultimately, we should not view vehicle automation through rose-colored glasses. The ultimate effect of automation on travel and energy demand may be positive or negative, and we cannot yet say which. Clear-headed analysis, evaluation, and adaptive policymaking provide the greatest chance of realizing the full benefits of automation and minimizing the costs”


Source: http://worryandpeace.com/buzz/4-sci-fi-tech-innovations-/
So how could we go about estimating the potential impacts of autonomous vehicles on travel behaviour?

- Plenty of predictions have been made, but who’s to say they’re correct?
- Numerous claims about the benefits, but where’s the evidence?
- One approach is to look at how travel behavior with autonomous vehicles is likely to change over different life stages:

<table>
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<tr>
<th>Age Group</th>
<th>Life Stage</th>
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<td>0-11 years</td>
<td>Infancy &amp; childhood</td>
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<td>12-17 years</td>
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<td>25-65 years</td>
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<td>66-75 years</td>
<td>Adulthood</td>
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<td>76+ years</td>
<td>Mature adulthood</td>
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- **Monash University**
- **ITS (Monash)**
- **Public Transport Research Group**
Children (0-11 yrs) are highly unlikely to travel independently in an autonomous vehicle; car trips unlikely to change much

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- Very limited ability to travel independently
- No driver’s license or ability to drive a car
- Travel by car is always as a passenger
- Car travel generally determined by parent/s
- Public transport use may change in line with parent/s preferences towards autonomous vehicles

No significant change in car trips expected for this group
Adolescents (12-17 yrs) could travel independently in an autonomous vehicle; this may result in an increase in car trips

- Some ability to travel independently, e.g. public transport
- No driver’s license or ability to drive a car independently
- Current car travel is generally constrained by parents
- Autonomous vehicles could remove constraints and may even result in a switch from public transport
- Additional (new) trips could occur
- However, ridesharing may increase among this group

**Increase in car trips expected for this group**
Early adults (18-24 yrs) may rideshare more often, but there may also be some diversion from public transport

- Ability to travel independently
- Lower driver licensing rates than older adults; also higher rates of public transport use and car passenger trips
- Autonomous vehicles could result in a switch from public transport, yet ridesharing may increase among this group
- Additional (new) trips unlikely to occur

Small increase in car trips expected for this group
Adults (25-65 yrs) may divert from public transport into autonomous vehicles in some cases

- Ability to travel independently
- Highest driving license rate (93%) across all groups
- Highest rate of car driver trips (generally double) across all groups; lowest rate of car passenger trips
- Autonomous vehicles could result in a switch from public transport; questionable whether ridesharing will increase
- Additional (new) trips unlikely to occur

No significant change in car trips expected for this group
Older adults (65-75 yrs) may also divert from public transport into autonomous vehicles in some cases

- Ability to generally travel independently
- Relatively high driver licensing rate (87%)
- 2\textsuperscript{nd} highest rate of car driver trips across all groups
- Autonomous vehicles could result in a switch from public transport; questionable whether ridesharing will increase
- Additional (new) trips unlikely to occur

Small increase in car trips expected for this group
Elderly (76+ yrs) could travel more independently with autonomous vehicles; likely to result in an increase in car trips

- Limited ability to travel independently; constrained travel
- Lowest driver licensing rate (68%) across all adults
- Lowest trip rates across all groups (half of the average)
- Autonomous vehicles could remove travel constraints and may even result in a switch from public transport
- Ridesharing may decrease from current levels
- Additional (new) trips could occur

**Large increase in car trips expected for this group**
Net result could be an overall increase in car trips, even when not accounting for empty vehicle running (e.g. return trips)

Will traffic congestion increase with autonomous vehicles?
Will public transport use decline or is this an opportunity for us?
Driverless buses present a revolutionary opportunity for the bus industry with many potential benefits...

- Ability to increase span of operating hours (late night services) and substantially increase service frequencies due to savings in driver costs
- Ability to fill gaps in service provision through Demand Responsive Transport (DRT), particularly in low density fringe areas
- Huge opportunities to tackle the ‘last mile’ problem effectively
- Potential for accident savings (drivers currently at-fault 56% of time)
- Could bus operators also be ‘car operators’ for autonomous vehicles?
...with driverless bus trials underway in many countries
Emerging issues with driverless buses

- Employment of drivers – can they be redeployed to other roles?
- Hardware & software security issues, e.g. hacking of vehicle control
- Costs of purchasing and maintaining technology
- Transition period from driver control to autonomy
- What happens when an accident is inevitable? What rules are adopted?
Take home messages

- What is an autonomous vehicle?

  *A vehicle that can drive itself to a predefined destination using various sensors & technologies; 5 levels of vehicle automation*

- What are their potential impacts on travel behaviour?

  *Autonomous vehicles *could* *result in an increase in car trips, particularly among adolescents (12-17 years) and the elderly (76+ years)*

- What opportunities are possible with driverless buses?

  *Increased operating hours and service frequencies, greater potential for DRT, delivery of ‘last mile’ services, accident savings*
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