



UMTRI

**Potential Societal
Implications of Autonomous
Vehicles**

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Technical, Legal, and Social Implications of Automated Vehicles

- The majority of the conversation is on technical challenges
 - Sensors, algorithms, etc.
- Some of the conversation is on the legal challenges
 - Who's responsible, need for insurance, etc.
- Not as much being said about the social implications

Potential Intended and Unintended Consequences

- Not suggesting these changes will happen, just that they could happen
 - We don't know
 - Changes in the nature of travel
 - Changes in vehicle ownership
 - Changes in interactions between road users
 - Changes at the individual level

Changes in the Nature of Travel

- Will people travel further?
 - If time spent in an autonomous vehicle is more productive, less stressful, then people may spend more time in the vehicle
 - Urban sprawl
 - More energy used
 - Potential overall increase in congestion
 - Increased exposure to crash risk
 - Shared/coordinated delivery of goods and people could reduce this
 - Reduce the need to travel

Changes in the Nature of Travel

- Will people travel more frequently?
 - If autonomous vehicles are incredibly convenient, will people travel more often?
 - More energy used
 - Potential overall increase in congestion
 - Increased exposure to crash risk
 - Additional parking needs
 - Shared/coordinated delivery of goods and people could reduce this
 - Reduce the need to travel

Changes in the Nature of Travel

- Will vehicles travel further/more often?
 - If autonomous vehicles can operate driverless, will they be sent home, to satellite parking?
 - More energy used
 - Potential overall increase in congestion
 - Prime real estate for parking reduced
 - Vehicle miles traveled (VMT) vs. person miles traveled (PMT)
 - Implications for road funding and crash risk

**MORE THAN 86% OF U.S.
HOUSEHOLDS HAVE AT LEAST ONE
CAR FOR EVERY DRIVER IN THE
HOME, AND 28% REPORT HAVING
MORE CARS THAN DRIVERS.**

AAA FOUNDATION, 2016

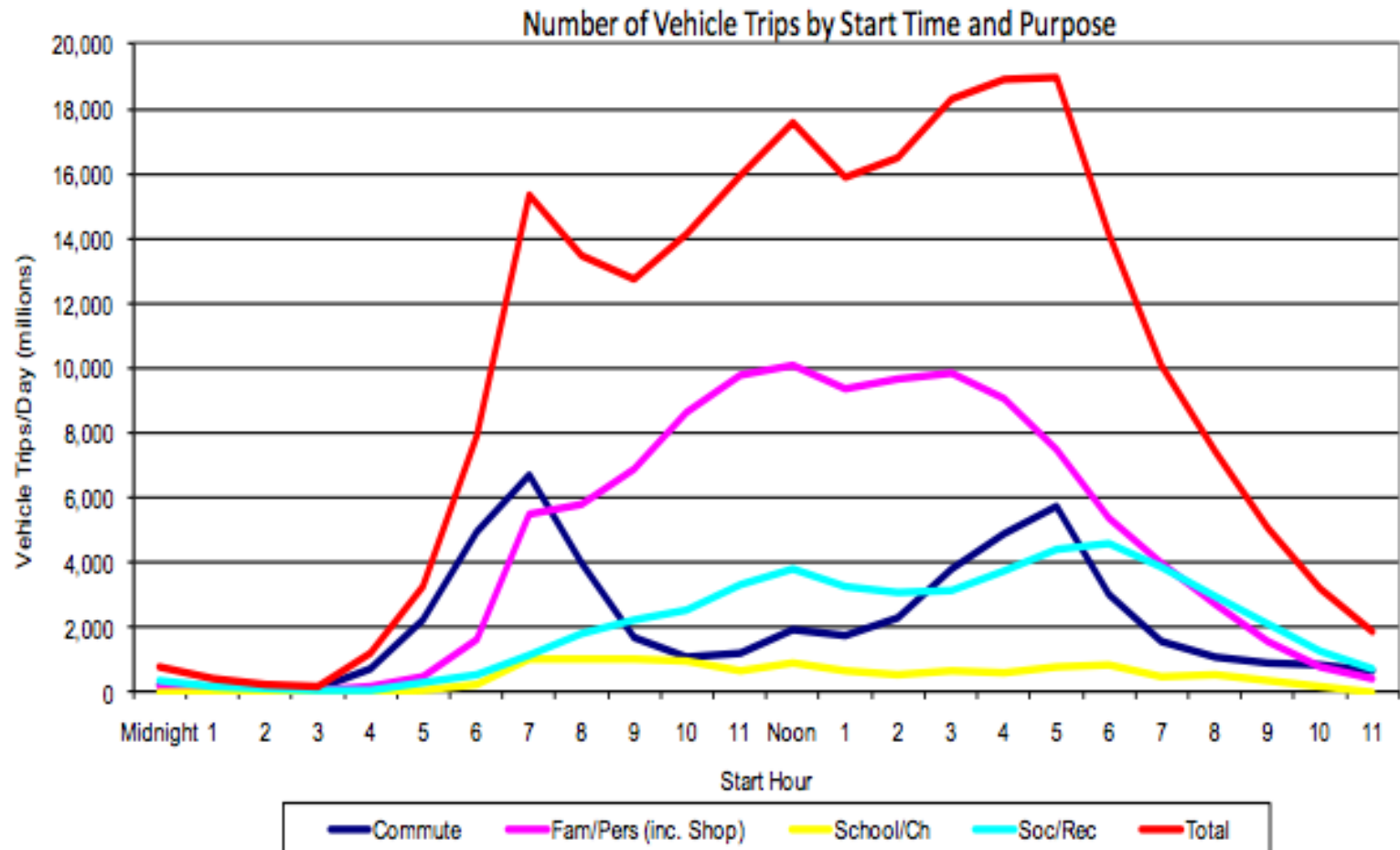
Changes in Vehicle Ownership

- Will the number of vehicles change?
 - If I can afford to, and convenience is great enough, I might own four vehicles
 - Four cellular phones, five laptops, three TVs, etc.
 - If shared/coordinated vehicles, or and alternative, are abundant enough I might own no vehicles
 - Its likely to be both
 - Some will own fewer vehicles, others own more

Changes in Vehicle Ownership

- Can autonomous shared/coordinated vehicles resolve all travel needs?
 - Reliable, alternative transportation still needed
 - Personal vehicles and mass transit
 - We live our lives by the clock
 - Significant amount of travel occurs in the morning and the evenings, at least on workdays
 - Shared vehicles, without shared passengers, means that the demand is likely to out strip the supply
 - May not address congestion

Figure 12. Distribution of Vehicle Trips by Trip Purpose and Start Time of Trip
2009 NHTS.



Changes in Interactions Between Road Users

- Eye-to-eye contact and acknowledgement is lost
 - “Do they see me?”, “Will they let me in?”
 - Waiving to a driver/pedestrian/bicyclist to proceed
 - Responding to police hand signals at crash scene or road construction site

Changes at the Individual Level

- Changes in the workforce
 - 3 million taxi, chauffer, bus and delivery jobs
 - Might be replaced by new delivery industry
- Changes in our skills
 - Will we know/remember how to drive?
 - Blackout of 2003 in US and Canada
- Changes in our physical or social activity
 - Will we get more or less exercise than now?
 - Will we get more or less time with our family?



Changes in Services

- How will the infrastructure need to change:
 - More parking spaces, or less
 - Eliminate need for road signs, street lighting, and traffic signals
 - Municipal revenue from traffic and parking tickets
 - Will the workforce exist with the technical skills to
 - Maintain/repair vehicles
 - Maintain/repair the infrastructure

Changes in Services

- Physical assistance out of a dwelling and to the vehicle
- Physical assistance in and out of vehicle



Changes in Services

- Trip planning (account for traffic or construction)
- Seatbelt or wheelchair anchoring



Changes in Services

- What if ?
 - Main entrance is closed, or disabled entrance is other than the main entrance
 - The destination is new, or private property, and not on map
 - No assistance is available at arrival



Understanding the Total Impact

- Autonomous vehicles could clearly provide benefits
- Make sure we understand all potential positive and negative implications
 - Ecosystem approach
- Significant need to deploy the technology to understand the implications
 - We can't assume that we understand all of the implications in advance

The technical challenges remain substantial to achieve fully autonomous

- For a level of personal mobility we currently enjoy

The greatest remaining challenges to vehicle automation are not technical

- Yet they are receiving the least amount of attention



Thank You

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