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**TRB Forum
on Preparing for
Automated Vehicles
and Shared Mobility**

**Mini-Workshop on the
Economic Implications
of Automated Vehicles
and Shared Mobility**

July 14, 2019
Orlando, Florida

The National Academies of
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TRB Forum on Preparing for Automated Vehicles and Shared Mobility

*Mini-Workshop on the Economic Implications
of Automated Vehicles and Shared Mobility*

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American Association of State Highway and Transportation Officials

Art Guzzetti

American Public Transportation Association

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Transportation Research Board

July 14, 2019
Orlando, Florida

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Preface

The deployments of automated vehicles, shared mobility services, and other transformational transportation technologies have the potential to dramatically increase safety, reduce congestion, improve access, enhance sustainability, and spur economic development. However, success in meeting these goals is not assured, and there are significant risks that these deployments could cause unintended consequences.

The National Academies–TRB Forum on Preparing for Automated Vehicles and Shared Mobility was officially launched in early 2018 to facilitate evidence-based research needed to deploy these technologies in a manner and timeframe that informs policy to meet these long-term goals. This E-Circular summarizes a workshop held by the Forum to discuss the roles of government and the public sector as these technologies are advanced.

King W. Gee of the American Association of State Highway and Transportation Officials (AASHTO), Art Guzzetti of the American Public Transportation Association (APTA), and Katherine Kortum of the Transportation Research Board authored the paper.

ACKNOWLEDGMENTS

A small volunteer group of Forum members and TRB staff planned and organized the mini-workshop described in this report. Members of this group were:

- King W. Gee, AASHTO
- Art Guzzetti, APTA
- Katherine Kortum, TRB
- Mark Norman, TRB

PUBLISHER'S NOTE

The views expressed in this E-Circular are those of individual white paper authors, the Forum members, and of the Forum participants and do not necessarily represent the views of all participants, the Transportation Research Board, or the National Academies of Sciences, Engineering, and Medicine. This E-Circular has not been subjected to the formal TRB peer review process.

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Introduction

In order to better inform all Forum participants and generate discussion on the strategic crosscutting issues of deployments of automated vehicles (AV) and shared mobility (SM) services, participants held a series of “mini-workshops” in 2019. These mini-workshops focused on answering three main questions:

1. Why is the subject area of critical importance?
2. What is the current state of play?
3. What might the future hold?

The Economic Impacts of Automated Vehicles and Shared Mobility Mini-Workshop occurred on July 14, 2019, in Orlando, Florida. This workshop summary includes panelists’ remarks, summaries of breakout group discussions, panelists’ reactions to these discussions, and a set of key takeaways. This e-circular, while brief, is intended to complete the series of five e-circulars resulting from the five workshops.

Workshop Format and Agenda

The workshop's objective was to consider what research is still needed on the economic implications of automated vehicles and shared mobility that would inform actions to maximize benefits and mitigate disbenefits. This research would then also inform funding and financing options.

The workshop contained two presentations, each of which was followed by a breakout session. Workshop leaders randomly divided participants into three breakout groups to discuss their reactions to and feedback on the presentations.

Overall, the workshop leaders asked the participants to keep the following questions in mind as they thought through needed research:

1. Which research questions are of immediate importance, versus those dependent on deployment phase or technology development?
2. Who should be sponsoring or underwriting such research?
3. Who are the key audiences for the results of such research?

Summary of Panelist Presentations

ECONOMIC IMPACT AT THE SYSTEMS LEVEL

Dick Mudge of Compass Transportation provided an opening statement, giving his perspectives of the systems-level economic impact analyses needed to advance automated vehicles and shared mobility (AV&SM). He pointed out that the impacts of AVs are hard to forecast and will be nonlinear. In the past, forecasts about transformational changes missed the mark, and often by a wide margin. In general, these inaccurate forecasts underestimated the impacts and provided very little economic analysis. Decisions about what actions to take were made on a “common-sense” basis. Despite this past experience, clear funding and a business case for decisions is important, both in AVs and in all transformational decision-making processes.

After Mudge’s presentation, Forum members broke into three groups. Some of the key highlights of the breakout discussions included the following areas of needed research:

- Testing and validating key assumptions in macroeconomic studies.
- How technical feasibility and business models are applied in specific scenarios under different environments (politics, demographics, density).
- User acceptance and public perception challenges (overcoming skepticism and negative publicity).
- What economic and safety benefits are available at different levels of market penetration?
- Economic factor differences for goods movement via AV&SM versus that of personal mobility.
- Economy impacts when good transportation options are provided to the mobility disadvantaged.
- Governance and policy levers for AV&SM on larger policy issues (e.g., environment, congestion, jobs, access to health care, sprawl and land use, equity, sustainability, security).
- Economic impacts on labor and markets.
- Shared vocabulary and common frames-of-reference, Mobility-as-a-Service, ancillary services.
- How might early adopters such as freight, transit, and taxi help lead the way to broader adoption?

SPECIFIC ECONOMIC IMPACT ANALYSIS AREAS

During this presentation, the group considered the application or topic-specific economic impact analyses needed to facilitate or support deployment of AV&SM. Cathy McGhee, Virginia Transportation Research Center, presented her perspectives. She reviewed the media attention focused on the potential of AV&SM along with the downsides. Job losses may or may not be significant, but fear of them is a limiting factor. There is also potential for increased vehicle miles traveled and unknown impacts to the auto manufacturing industry, as it is not yet clear how

demand for vehicles will change in an era of highly automated vehicles coupled with shared mobility. Transportation revenues may also shift.

McGhee highlighted some of the research needs she sees. She posed the following questions:

- Many of the economic analyses are based on modeling, but how confident are we in modeling assumptions regarding traveler behavior?
- What industries will be most impacted by AV&SM and how can job losses be mitigated?
- Finally, how can states best prepare for changes in both travel patterns and transportation revenues?

After breaking out into the same three groups, Forum participants developed the following key issues about priority needs:

- Applicability of AV&SM in different scenarios, and different phases and levels of automation in “critical mass” contexts (e.g., a major demo in a metro area).
- Culture change and vehicle sharing attitudes under specific scenarios, regional differences, and sociodemographic factors, and what implications does this have for outcomes.
- Monetary—pricing tools to address VMT/PMT, parking, curb space access.
- Transaction cost factors for mobility.
- One payment impact on use and access.
- How and when can AV&SM complement traditional public transportation?
- What is the right role of government and transit agencies to assure equity, and would a clearer AV&SM policy framework foster better outcomes?
- Should there be consistent ODDs for AV suppliers?
- Would CV development accelerate the achievement of full automation (level 5)?
- Implications for effective disaster response in a shared AV world (e.g., in mass evacuations).
- What are the challenges and opportunities of AV&SM in rural areas?
- How can we clearly assess the negative impacts of AV&SM and how should we mitigate such consequences?
- How might early adopters such as freight, transit, and taxi help lead the way to broader adoption?
- Penetration levels—develop an understanding of economic benefits that come with different levels of AV market penetration. What might we expect to see at 10% market penetration? At 20%? At 50%? The analyses should look at the impact of market penetration relative to specific benefits such as safety and efficiency.
- How does AV&SM rise and/or fall when tested in the context of current policy issues and possible solutions, such as carbon taxes, congestion fees, job access, sprawl levels, driver shortages, and environmental and financial sustainability?

Presentations from the meeting are available online at

<http://www.trb.org/trbavsmforum/July2019TRBAVSMForumMeeting.aspx>.

Key Takeaways

During the workshop, Forum participants discussed a number of key takeaways from the discussion. They are as follows.

- The economic impacts of transformational changes are difficult to forecast.
- Economic forecasts of previous transformational changes have missed outcomes, and often by a wide margin.
- The economic impacts have usually been underestimated, and as a result, decisions have been made on a “common-sense” basis, with relatively little reliance on economic analyses.
- In addition, the economic impacts have usually been nonlinear.

A clear funding and business case will be important for the success of AVs and shared mobility. Neither the funding nor the business case has yet been clearly articulated.

Research is needed in the following areas:

- Efficacy of key assumptions
- Modeling for specific scenarios
- Impacts of user acceptance
- What economic and safety benefits accrue at different levels of market penetration
- Economic impacts when good options are provided to the transportation disadvantaged
- Relationships between economic impacts and impacts on other policy issues
- Environment, congestion, sprawl, equity, sustainability
- Jobs
- Transit
- Impacts of pricing tools
- VMT, parking, curb space access
- Transaction cost factors
- One payment systems
- Mobility-as-a-Service

Next Steps

At the workshop, Forum participants also discussed the next steps for research on automated vehicles and shared mobility, which include the following.

- Refining and sifting of the research areas, and vetting by the Forum participants
- Collaboration and coordination of research sponsorship
- Engaging policy makers on the available research results
- Development of policies and infrastructure that accelerate achievement of AV&SM benefits
- Taking actions that mitigate negative impacts

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