



What Have We Found? What's Next?

Takeaways from AAA Foundation's Research

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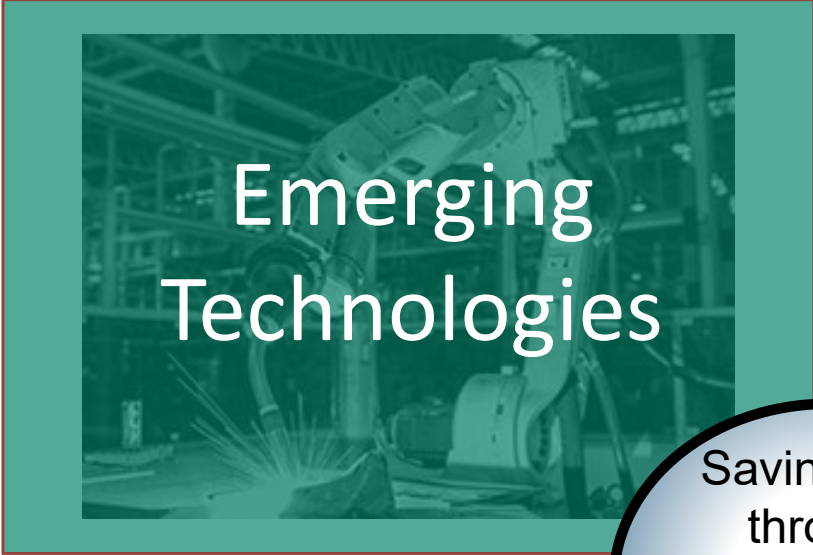
5th SIP-adus Workshop on Connected
and Automated Driving Systems

Tokyo, Japan
November 14, 2018

Introduction Video



Research Focus Areas



Emerging
Technologies

The image shows a robotic arm in a factory setting, overlaid with a teal gradient.



Vulnerable
Road Users

The image shows two people in a car, one driving and one in the passenger seat, overlaid with a blue gradient.

Saving lives
through
research
and
education



Driver
Behavior &
Performance

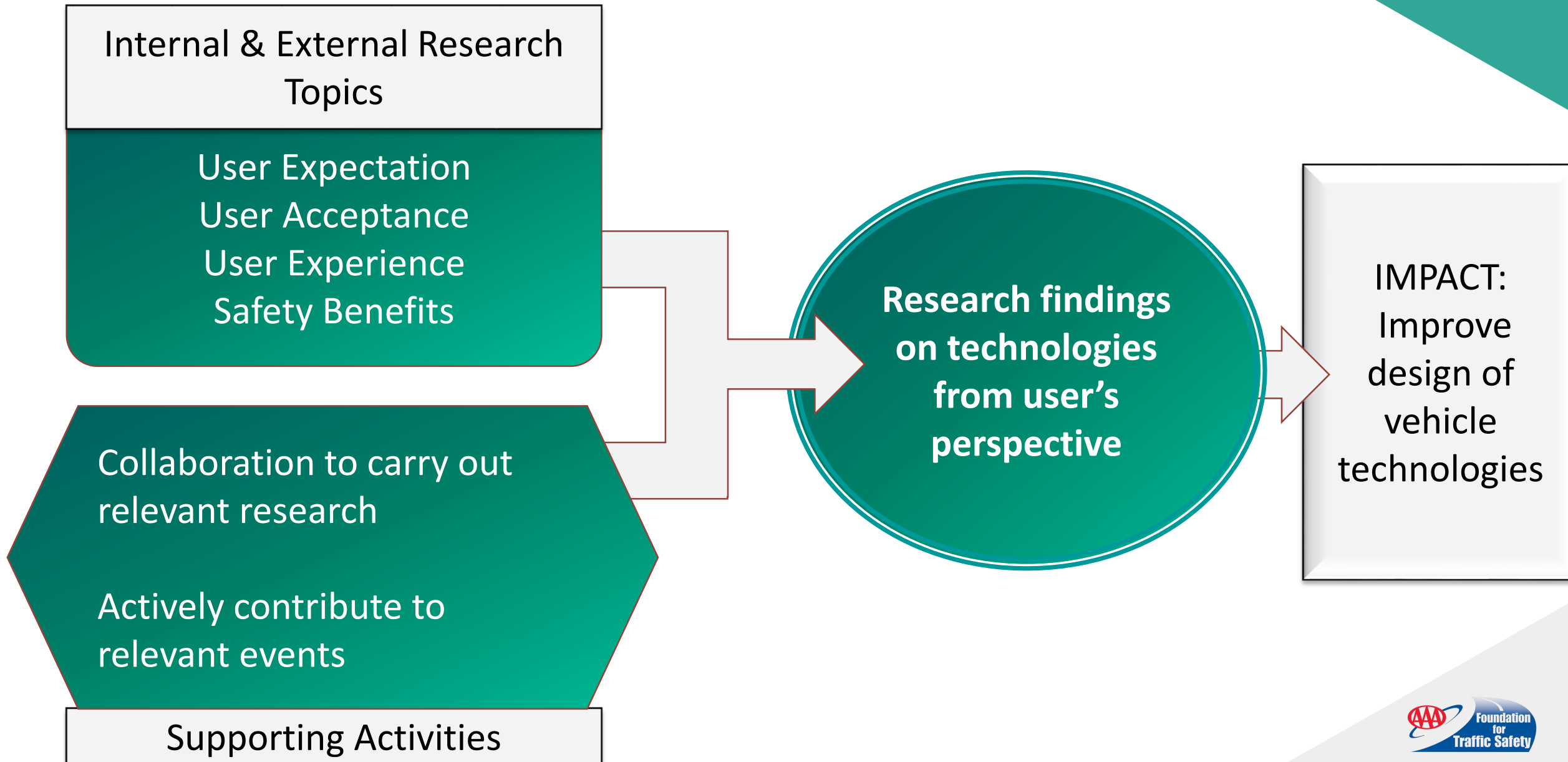
The image shows a car crash scene with a damaged vehicle, overlaid with a red gradient.




Roadway
Systems &
Drivers

The image shows a traffic jam on a multi-lane highway, overlaid with an orange gradient.

EMERGING TECHNOLOGIES




Visual & Cognitive Demand Associated with Vehicle Technologies (1 of 2)



Visual and Cognitive Demands of Using Apple's CarPlay, Google's Android Auto and Five Different OEM Infotainment Systems

June 2018



607 14th Street, NW, Suite 201 | Washington, DC 20005 | 202-638-5944

FACT SHEET JUNE 2018

VISUAL AND COGNITIVE DEMANDS OF USING APPLE'S CARPLAY, GOOGLE'S ANDROID AUTO AND FIVE DIFFERENT OEM INFOTAINMENT SYSTEMS

INTRODUCTION

Many in-vehicle information systems (IVIS), also known as infotainment systems, involve complex interactions to perform a task that requires the press of a button, a touch screen or a voice command. These interactions may distract motorists from driving by diverting their eyes and attention from the road and hands from the steering wheel. Prior research sponsored by the AAA Foundation for Traffic Safety provided a comprehensive assessment of 30 vehicles from a variety of manufacturers and the demand generated by the built-in (native) IVIS when using it to do things like give a voice command to send a text message. However, many manufacturers now provide access to Apple's CarPlay® and Google's Android Auto®, which allow the driver to pair a smartphone with the vehicle to perform IVIS tasks through the vehicle's interface.

As part of AAA's Center for Driving Safety and Technology, the AAA Foundation for Traffic Safety partnered with the University of Utah to examine these systems and address the following questions:

- How demanding are CarPlay and Android Auto in comparison with built-in (native) infotainment systems?
- How demanding are these systems when performing different tasks? Tasks include: calling/dialing, sending a text message, programming audio entertainment or programming navigation.
- What level of demand is associated with completing these tasks using voice commands, touchscreens or other interactive technologies (e.g., buttons, dials)?
- How does the demand vary across different types of vehicles?

KEY FINDINGS

With respect to the overall system comparison:

RESULTS

- Both CarPlay and Android Auto systems were less demanding than built-in (native) infotainment systems for the tasks employed.
- CarPlay and Android Auto systems generated an overall moderate level of demand, whereas the built-in (native) systems led to overall very high levels of demand.

With respect to different types of tasks (calling or dialing, text messaging, programming audio entertainment or programming navigation):

RESULTS

- For most tasks, both CarPlay and Android Auto systems were less demanding than built-in (native) infotainment systems.
- CarPlay had lower overall demand than Android Auto for sending text messages.
- Android Auto had lower overall demand than CarPlay for programming navigation and was much less demanding than built-in (native) infotainment systems.

ABOUT

Established in 1947 by AAA, the AAA Foundation for Traffic Safety is a not-for-profit, publicly funded, 501(c)(3) charitable research and educational organization. The Foundation's mission is to prevent traffic deaths and injuries by conducting research into their causes and by educating the public about strategies to prevent crashes and reduce injuries when they do occur. This research is used to develop educational materials for drivers, pedestrians, bicyclists and other road users. Visit www.AAAFoundation.org for more information.

MORE INFORMATION

AAAFoundation.org

AAA FOUNDATION FOR
TRAFFIC SAFETY
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Visual and Cognitive Demands
of Using In-Vehicle Information Systems
[View Report](#)

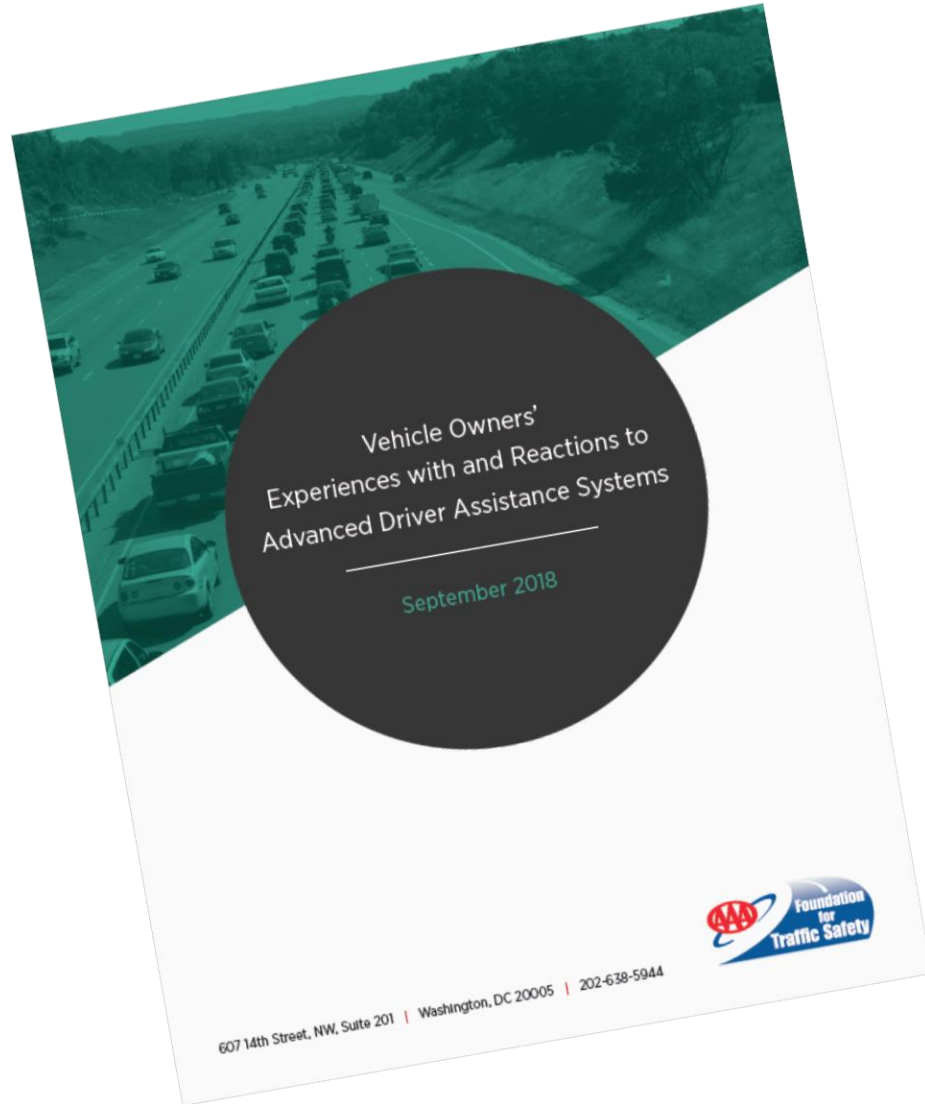


Visual & Cognitive Demand Associated with Vehicle Technologies (2 of 2)

- CarPlay and Android Auto systems were less demanding than built-in (native) infotainment systems for the tasks employed – moderate level of demand
- Visual demand associated with CarPlay and Android Auto was lower for both auditory/vocal and center stack interactions vs. native systems

Independent research funded by AAA Foundation → Offer suggestions to technology companies & automakers to enhance their designs, minimize demands placed on drivers

Vehicle Owners' Experiences with ADAS (1 of 2)



- Surveyed registered owners of 1,200+ 2016-2017 ADAS-equipped vehicles
- Examined attitudes, experiences, knowledge, learning, sources of info
- In collaboration with University of Iowa

Vehicle Owners' Experiences with ADAS (2 of 2)

- Generally favorable opinions about all tech examined
 - High % trusts, finds useful, feels safer, would buy again, recommend to others
- Main sources of info = owner's manual, dealer, trial and error
 - Negligible % reported consulting other online resources
- Some concerning knowledge gaps, compensatory behaviors
 - ~30% report at least sometimes changing lanes without visual check
 - 20-30% comfortable engaging in other activities while driving with ACC, AEB

Potential Safety Benefits from ADAS (1 of 2)

- How many crashes, injuries, and deaths could potentially be prevented if all vehicles had ADAS technologies?
- Technologies examined:

Longitudinal Systems	Lateral Systems	
Forward Collision Warning	Lane Departure Warning	Blind Spot Monitor
Automatic Emergency Braking	Lane Keeping Assist	

Potential Safety Benefits from ADAS (2 of 2)

- Having FCW / AEB on all cars could potentially prevent
 - 1,994,000 crashes (29% of crashes – mostly rear-end)
 - 4,738 deaths (14% of all deaths – mostly pedestrians)
- LDW / LKA could potentially prevent
 - 519,000 crashes (7% of crashes – mostly road departure)
 - 4,654 deaths (14% of deaths – road departure + head-on)
- BSW could potentially prevent
 - 319,000 crashes (5%)
 - 274 deaths (<1%)

Advanced Driver Assistance and Semi-Automated Vehicle Systems and Improper Driving Behaviors

- Investigate potential change in crash risk in relation to driver interactions with ADAS
 - Extent to which drivers may experience distraction and fatigue relative to use of ADAS
- Three existing naturalistic driving data sets
 - SHRP 2 NDS
 - Level 2 Mixed Function Automation NDS
 - VTTI Advanced-Vehicle Study

Traffic Safety Culture Index & Emerging Transportation Technologies (1 of 2)

2018 survey included additional items pertaining to AV such as:

- Understanding of AVs
- Perceived benefits of AVs
- Perceived risks/concerns of AVs



<https://www.cnet.com/roadshow/news/self-driving-car-guide-autonomous-explanation/>

Traffic Safety Culture Index & Emerging Transportation Technologies (2 of 2)

- Understand role of emerging technologies in today's traffic safety culture & future
- Characterize users' expectations & acceptance of emerging technologies in relation to other factors
- Explore relationship between traditional traffic safety and emerging technologies-related beliefs & perception
- Examine possible determinants of user acceptance

2017 Forum



Discuss & identify research needs → impact of vehicle technologies/automation for users

Make connections and work together → shape future of vehicle technologies



2018 Forum

Theme:

*Impact of Vehicle Technologies and
Automation on ...*

Vulnerable Road Users

Driver Behavior & Performance

Date: November 7th & 8th, 2018

Location: University of Iowa

Forum Report: January 2019

What Have We Found? What's Next?

“It is complicated”

“The devil is in the detail”

“Data is the new oil”

“It takes a village”

A photograph of a rowing team in a blue boat on a body of water. The team consists of several people wearing red life jackets, rowing in unison. The water is blue and reflects the boat and the rowers. The text is overlaid on the image in a white, bold, serif font.

*Coming together is a
beginning, staying
together is progress, and
working together is
success.*

Henry Ford



Learn more about AAA Foundation
<https://www.aaafoundation.org>