Human and Mobility Impacts of Autonomous Vehicles

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Technology Takes the Wheel
Autonomous Vehicle Seminar Series

October 11, 2019
Harmonize Components of Transportation System

Users

Infrastructure

Vehicles
Research Focus Areas

Emerging Technologies

Vulnerable Road Users

Driver Behavior & Performance

Roadway Systems & Drivers

Saving lives through research and education
EMERGING TECHNOLOGIES

Research Topics

User Expectation
User Acceptance
User Experience
Safety Benefits

Technical Documents

Collaboration
Cultivating Connection

Assessing innovation beyond the dashboard

https://www.orioninfosolutions.com/
• Examined knowledge, attitudes, experiences of drivers who owned vehicles with ADAS

• Performed by University of Iowa for AAA Foundation
Methodology

• Catalogued technologies for vehicles comprising 99% of total market share (2016-2017)

• Purchased list of 10,000 names & addresses of registered owners of vehicles with 3+ systems standard
  o Distribution of vehicles roughly proportional to market share
  o List from IHS Automotive (formerly RL Polk & Co.)
  o Included data from most states in U.S.
Findings

• Generally favorable opinions about technologies examined
• Main sources of information on ADAS – owner’s manual, dealer, trial and error
• Nearly 1:3 owners of vehicles with ACC reported feeling comfortable at least occasionally engaging in other tasks while driving because of ACC
• Nearly 1:3 owners with BSM reported sometimes changing lanes without manually checking blind spot
Example: Understanding of BSM
(509 owners of vehicles with BSM)

Which of the following is true of blind spot monitoring systems?

- I DON'T KNOW: 32%
- THEY ARE DESIGNED TO ACCURATELY DETECT MOTORCYCLES, BICYCLES, AND PEDESTRIANS: 28%
- ARE NOT DESIGNED TO DETECT VEHICLES PASSING AT EXTREMELY FAST SPEEDS: 21%
- MONITOR THE ROADWAY DIRECTLY BEHIND YOU: 18%
Traffic Safety Culture Index & Emerging Transportation Technologies (TSCI-ETT)

2018 survey included additional items pertaining to automated vehicles (AVs) such as:

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

TSCI-ETT (continued)

Purpose of extension

- 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
Understanding the Impact of Technology: Can Advanced Driver Assistance and Semi-Automated Vehicle Systems Lead to Improper Driving Behavior?

• An increased prevalence of secondary task engagement because of greater perceived workload capacity or reduced perceived responsibility for driving safety?
Impact of Drivers’ Mental Models of Advanced Vehicle Technologies on Safety and Performance

• Examine how errors in drivers’ understanding (mental models) of automated systems impact their in-vehicle behaviors, safety & performance
Study Approach

• Review & development of error taxonomy
  o Literature & technology review
  o Task analysis for ADS and ADAS errors

• Driving simulator study
  o Measure and differentiate drivers with good, moderate and poor mental models
  o Examine driver performance and safety in critical “edge case” scenarios
  o 108 drivers (ages 40-65) in a high fidelity driving simulator
Impact of Information Sources on Consumer Understanding of Automated Driving Systems

- Many drivers do not understand limitations of advanced vehicle technologies
- Names not standardized, may contribute to confusion
- Consumer information vs. understanding & behavior
Impact of Vehicle Technologies & Automation Forums

November 4-5, 2019 – University of California San Diego

January 2018

January 2019
Technologies have great potential to improve safety by influencing behaviors of users.

Good designs will encourage correct & safe behaviors.

Proper use & application of technologies will lead to safety improvements.