

Characterizing perceptions of automated driving systems based on usage of advanced driver assistance systems: A methodology

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Abstract

Advanced driver assistance systems (ADAS) assist drivers by warning them about or detecting and responding to imminent conflict. Despite stated benefits, there are still unknowns about drivers' interactions with these systems: how do these technologies affect driver behaviors; how do drivers perceive their benefits; will there be unexpected adaptation to these systems. To address these, this research used structured interviews and focus group approaches with owners of vehicles equipped with these systems to examine drivers' perceptions of safety benefits, concerns, and utility of ADAS. Multiple themes emerged that offer important insight into users' perceptions, trust, acceptance, and adoption of such systems.

Background

- Automated driving systems (ADS) comprise technologies, i.e., advanced driver assistance systems (ADAS), that assist drivers by supplementing their capabilities through warnings about potential conflicts, or detecting and responding to imminent collisions faster than the driver can (e.g., *Figure 1 shows diversity of ADAS systems*).

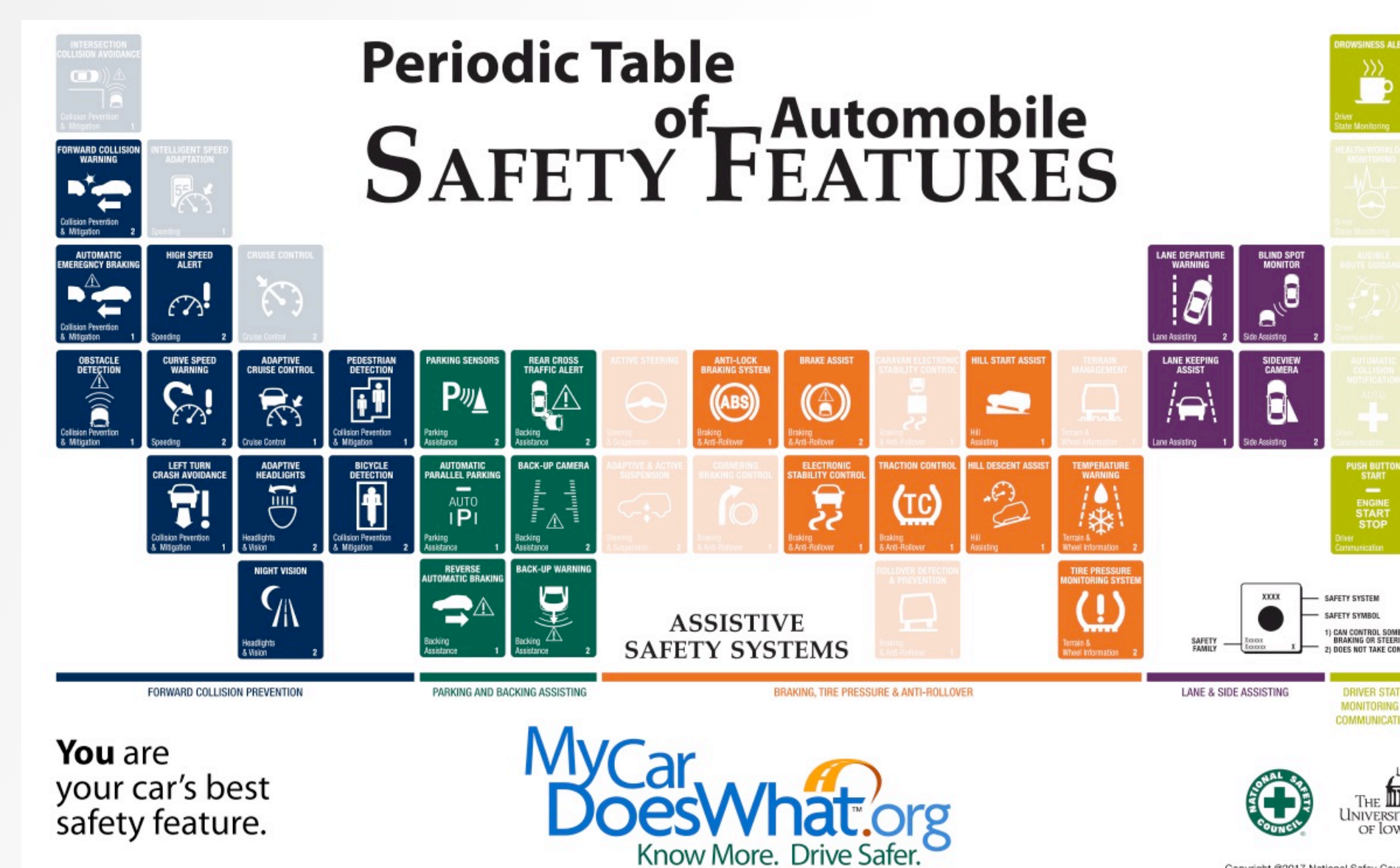


Figure 1 – Source: www.mycardoeswhat.org

- ADS can include single and multiple ADAS capabilities that can categorize vehicles according to the SAE automation definitions.
- There is specific interest in drivers' perceptions of higher automation capabilities (Level 3 and above), and how various driver characteristics may affect the acceptance and use of such ADS.
- Currently, this is difficult to study since vehicles with these levels are not available for consumers.
- However, Level 2 vehicles (longitudinal and lateral control under ADS), have been deployed. Examining user perceptions of such systems can help shape understanding of future usage, acceptance, and trust of higher level systems

Objectives

- The research aim was to examine actual users/owners of L2 vehicle technologies regarding their understanding and experiences
- Objective was to identify and categorize driver characteristics and attitude based on daily use of such systems.

Participants

- Study participants: 1) were of ages 25-85; 2) owned or leased a passenger vehicle with (SAE) Level 2 ADAS features; 3) had at least one month's familiarity with the vehicle; 4) drove at least three times per week; 5) were aware of ADAS features and used them at least once in either practice or regular driving; 6) were not currently employed in the auto industry, by an organization that conducts research, by an organization that does user research, or by an organization that conducts marketing; 7) had not participated in related research in the past year; and, 8) were able to read, understand, and speak English.

Methodology

The research was conducted in multiple phases: In-depth Interviews; Focus groups; Surveys.

- 1. Individual in-depth interviews were conducted** with owners of vehicles with Level 2 systems.
 - 10 participants were interviewed in-person for approximately 45 minutes.
 - Interview questions were based on literature, market analyses, and on multi-disciplinary team expertise.
 - These interviews informed directions for subsequent phases.

Methodology *(continued)*

- 2. Focus groups** were then conducted with drivers with similar expertise, i.e., experiences with ADAS
 - Seven focus group sessions were completed and 30 individuals participated.
 - All discussions conducted in-person, with each session conducted in the same conference room.
 - Sessions lasted 90 minutes and were facilitated by a trained moderator.
- 3. A survey** instrument was developed and piloted based on structured interviews & focus groups
 - 30 respondents (13 males)
 - Approximately 30-minute survey on Qualtrics
 - Survey items included: demographic and vehicle characteristics; driving exposure and history; driver traits; effectiveness of and attitudes toward AVTs; acceptance of AVT; trust in technology; trust in AVT; experience with and how learned to use AVT; behavioral adaptation; and purchase decisions.

Results / Summary

- Selecting vehicles/technology:** Manufacturer/Brand loyalty took priority over ADAS features; Drivers switching manufacturers did so based on feedback from close friends/family.
- Expectations:** Most felt technologies met or exceeded expectations; Most expressed some lack of trust; Some expressed increased overreliance;
- Learned to use:** All drivers provided with manuals by dealership, but only few offered demonstrations/orientation; Most declined demo; Most learned by experimentation;

This research generates foundational knowledge that can help inform strategies for design, training, awareness, and raising trust, all leading towards knowledge that can contribute towards future deployment.