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Caltrans Division of Research,
Innovation and System Information

Research Results

User Perceptions of Safety and Security: Toward a Framework for Transition to Electric, Shared, and Automated Vehicles

Developing a research and policy framework to guide transitions to electric, shared, and automated vehicles.

Transportation Safety and Mobility

DECEMBER 2019

Project Title:
National Center for Sustainable Transportation

Task Number: 3312

Start Date: November 1, 2018

Completion Date: May 31, 2019

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WHAT WAS THE NEED?

Three technologies are poised to revolutionize automobiles as most people know them. These "three revolutions" are electric propulsion, ride sharing, and automation. Sustainability claims for three revolution mobility systems include improved road safety and security, reduced emissions of regulated pollutants including greenhouse gases, and enhanced equity in public health and access to mobility and thus economic, social, and civic participation. However, claims of 90 percent reductions in road accidents appear to be based on merely extrapolating data indicating "human choice or error" contributed to upward of 90% of existing highway vehicle accidents in cars and trucks with human drivers. The assumption seems to be autonomous vehicles will nearly eliminate such "choice or error" without simply introducing new choices or errors.

Any successful transition to a new system of electrically powered, shared, and automated automobiles will depend on how actual and potential users of such systems perceive safety and security. Safety is the condition of being secure from accidental harm; security is the condition of being safe from intentional harm. This white paper on existing discussions and research into user perceptions of safety and security in the context of electric, shared, and autonomous vehicles addresses the first goal elaborated in Caltrans' Strategic Management Plan, 2015-2020, i.e., safety and health: "Provide a safe transportation system for workers and users…." In doing so, the white paper addresses these critical societal and technological trends for consideration in the California Transportation Plan and subsidiary Caltrans modal plans, including: impacts of shared mobility on vehicle miles traveled; public private partnerships for data gathering and sharing;

transportation equity, accessibility, and public health; transportation-related cybersecurity risk, meeting transportation needs in the midst of changing California demographics; and, zero emission vehicles, charging, and infrastructure.

WHAT WAS OUR GOAL?

The goal of this project was to create a research and policy framework to address the safety and security perceptions of users and potential users of new systems of electrically-powered, shared, autonomous vehicles. Further, in creating this framework, it was the goal of this project to engage relevant government, industry, and user stakeholders in the topic of how user' and potential users' perceptions of safety and security regarding electrically-powered, shared, autonomous vehicles affect the prospects for the timing and success of any transition to such vehicles.

WHAT DID WE DO?

The method was a literature review shaped and supplemented by key interviews with relevant policy makers, regulators, practitioners, and researchers. The literature reviewed concerns user perceptions and resulting effects of safety and security issues associated with the design and deployment of electrically-powered, shared, and automated vehicles. Key interviews to shape the white paper was solicited from the shareholders such as lawmakers, regulators, infrastructure providers and researchers.

There were six main tasks to be carried out. The first was to create an initial white paper outline. The second was to conduct the stakeholder interviews. The initial white paper outline also served as a discussion guide for these interviews. Circulating the draft outline affords stakeholders the opportunity to assure the white paper addresses their responsibilities for the safety and security of the traveling public and recommend documents to include in the literature review. The third task was to finalize the white paper outline based on the interviews. The fourth task was to write a draft white paper that incorporates the results of the interviews and of a review of existing literature. The fifth task was to circulate the draft white paper as well as a draft Policy Brief to stakeholders for comment and complete these two documents based on their review. The sixth and final task was to ensure the white paper and their recommendations of a user safety and security research and policy framework are distributed and available to a larger set of stakeholders than those engaged during this project.

WHAT WAS THE OUTCOME?

The confluence of vehicle electrification, sharing and pooling, and automation alters petroleum-fueled, human-piloted, and privately-owned and operated vehicles for personal mobility in ways that raises such questions as, "Are such systems safe and secure?" and, "Who is being kept safe and secure from what (or whom)?" Answers are implied by filling in the "who" and "whom" of the second question: system, product, producer, road, and user.

This white paper focused on users of systems of electrically-powered, shared, and automated vehicles (e-SAVs) as well as other road-users, e.g., pedestrians and cyclists. The role of user perceptions of safety and security are reviewed to create an initial framework to evaluate how they may affect who will initially use systems of e-SAVs for personal mobility and how safety and security will have to be addressed to foster sustained transitions. The paper will primarily be a resource for e-SAV user research, but will also inform system development, operation, and governance. This white paper offered an overarching framework grounded in the social theory of "risk society" and thus organized past work that, typically, focuses on only one of the constituent technologies or on one dimension of safety or security, e.g., collision avoidance as a subset of road safety.

WHAT IS THE BENEFIT?

The benefit is the organization and presentation of a user-centered views of safety and security of electrically-powered, shared autonomous vehicles so those views may be accounted for in the design, deployment, operation, and regulation of systems of such vehicles. Recognizing there are essentially no existing users of such systems, the framework is intended to guide future thinking and decision making such that net benefits to travelers, the State, and society are increased through attention to the conditions under which most of today's traveling public might become users of such systems.

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Link to final report or other pertinent info:
https://escholarship.org/uc/item/40g1637b