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Project Title

Public Perception of the Collection and Use of Connected Vehicle Data

University

Utah State University

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Research Needs

With the continued development and increasing prevalence of connected vehicles (CV), there is a growing need to understand the public perception of this technology in Utah and across the US. In particular, connected vehicles represent a potential source of immensely valuable data for traffic operations and planning. The successful collection and use of these data are directly related to public opinion and acceptance.

Connected vehicle data will encompass a variety of valuable metrics for traffic operations and planning. These may include speed, traction, lateral/vertical acceleration, windshield wiper activation, headlight activation, braking intensity, etc. These metrics can be used in a number of way to improve a transportation agency's operations, such as for pavement maintenance and monitoring, incident detection, weather response, etc. For planning purposes, connected vehicle data could potentially provide detailed trip data at a network level. There have been many studies on the small-scale collection and use of such data (Yu et al., 2015; Riviero et al., 2016; Pu et al., 2011; and more). The importance of these data cannot be downplayed. Public opinion can significantly affect the degree to which transportation agencies can utilize these data.

The landscape for CV technology is changing rapidly. No longer are the deployment dates twenty years into the future: connected and autonomous vehicles (CAV) are here today. What's more, significant advancements in the technology are expected in the next 3-5 years. The traveling public has limited involvement with these technologies and significant reasons not to trust or embrace the technologies. From an agency standpoint, there are the potential benefits of a safer and more efficient transportation system. Gathering public perception and determining sentiment is critically important to the deployment and use of these technologies.

It is important to understand public opinion and acceptance of the collection and use of what will be commonly viewed as private data. Anecdotally, the US population is very wary of government entities being able to track their movements and day-to-day activities (Clerkin, 2017). There have been limited studies in this area (Sahebi and Nassiri, 2017). The results of this research will provide transportation agencies with guidance for future management of connected vehicle data and public education on the technology.

The Utah State Department of Transportation (UDOT) conducted focus groups in Fall 2018 to gain a baseline analysis of the public sentiment towards connected and autonomous vehicle technology. The focus group results showed:

- On a rating scale of 1-7, when asked "What is your perception of CAV technology," gave an average mean rating of 5.71.
- On average, participants' perceptions decreased slightly after learning more about CAV technology, likely because the discussion sparked questions they had not thought of previously.
- Focus group participants had a significant disadvantage when discussing CAV technology because they were misinformed or completely unaware of the specific details of the technologies.

The focus group conclusions and recommendations showed that public messaging emphasizing safety, convenience, and time savings were a good way to increase public sentiment. This proposed research project will build upon this initial focus group data and can direct and guide future outreach. UDOT is planning to repeat the focus groups in Fall 2019 to determine if the baseline data has shifted and more of the traveling public are supportive of CV technologies. The deployment of CV technologies is heavily dependent on adoption and trust from the public.

Research Objectives

The purpose of this proposed project is to evaluate the current public perception of the collection and potential uses of connected vehicle data by transportation agencies (federal, state, and local). The proposed project will accomplish the following objectives:

1. Conduct a comprehensive review of existing literature on existing or potential uses of connected vehicle data and of previous public surveys in related areas.
2. Develop and distribute a survey based upon the results of the literature review and advisement from transportation agencies.
3. Analyze the survey results to determine trends in public perception and identify recommendations for future data management policies and public education.

Research Methods

In the proposed research, an extensive literature review will be conducted to assess existing/anticipated uses of connected vehicle data. Previous studies of public perception in the area of CAVs, such as the one by Sahebi and Nassiri (2017), will also be considered. The results of the literature review will inform the structure and questions of the survey. There will also be informal discussions with transportation agencies regarding their interests and concerns regarding CV data.

The survey methods to be used for this project qualifies for the Institutional Review Board Exemption 2. Approval of the Exemption Application is expected to take up to 4 weeks. The survey will be tested on a small sample to asses question clarity and potential bias. The survey will be distributed both electronically and physically. The survey will be promoted on social media platforms, with assistance from transportation agencies, such as UDOT. The survey will also be distributed in-person by students in high-traffic areas, such as grocery stores, rest areas, and events.

The survey results will be statistically analyzed to determine trends among different socio-economic groups. This may include statistical modelling, such as an ordered probability model, and statistical comparisons among socio-economic groups. The survey results will also inform recommendations regarding data management activities related to connected vehicle data. The results will be used in the development of sample public education and social media materials to influence and manage public opinion of connected vehicle data.

Expected Outcomes

This project is expected to, primarily, provide an assessment of the current public perception of the collection and use of connected vehicle data. In particular, it is expected that the findings of the survey will include trends among different socio-economic groups (ex. age), most common concerns (ex. privacy), and acceptance of potential uses of the data (ex. winter icing operations). The survey findings will inform recommendations regarding future data management policies and public education that can be utilized by transportation agencies. The most significant, expected impact of this project is the use of these findings by transportation agencies to influence public perception and shape how they collect and use connected vehicle data. Tangible products of this project will include a final project report, a survey for further distribution and adaptation by transportation agencies, a database of the raw survey data, and sample informational materials for public distribution.

Relevance to Strategic Goals

The proposed project contributes to the U.S. Department of Transportation (USDOT) strategic goal of Economic Competitiveness, as identified by the FAST Act. The findings of this project will promote the informed development of transportation policies regarding collection and use of connected vehicle data. This growing data source has the potential to affect lasting and equitable economic benefits via more effective resource deployment, large scope with limited physical infrastructure needed, and partnerships between businesses, government, and communities.

Educational Benefits

One graduate student will be involved in the research and receive training in survey development and statistical analysis. One to two undergraduate students will also be involved in the research and participate in the distribution of the survey. The research will provide survey data that will be incorporated into the transportation curricula at USU as a real-world data project.

Technology Transfer

Research results will be disseminated through publication in peer-reviewed professional journals and presentations at state and national meetings and conferences. Research results will also be

incorporated into relevant education, training, outreach and workforce development activities. Many research programs for CV technology are conducted and funded by private entities. Automakers are very competitive and often require their research to be confidential. Proprietary data sets can be prohibitively expensive to purchase or can be lacking in specific detail. All data collected from the research project will be stored in a repository such that the information will be easily retrievable by researchers in academic, public, and private sectors. There has already been a stated interest from UDOT regarding the use of this data.

Work Plan

The proposed project will be carried out over a 12-month period under the following timeline:

Task	Duration	Completion Date*
Literature Review We will conduct a comprehensive literature review on existing uses of connected vehicle data and previous surveys of public perception/opinion in relevant areas. This task will also include informal discussions with transportation agencies. This task will also include submission of Exception Application to IRB and approval is expected within 4 weeks.	2 months	2
Development of Survey We will develop the survey based on the results of the Literature Review and test/review the questions with colleagues and small samples.	2 months	4
Distribution of Survey We will distribute the survey electronically and physically. The survey will be promoted on social media platforms, with assistance from transportation agencies, such as UDOT. The survey will also be distributed in-person by students.	3 months	7
Analysis of Survey Results We will conduct statistical analyses of the survey results to assess socio-economic trends and develop recommendations for public education and engagement on the topic of CV data.	2 months	9
Product Development The literature review, survey methodology, and overall findings will be written in the final report. The sample public engagement materials will also be developed.	3 months	12

Project Cost

Total Project Costs:	$99,916.40
MPC Funds Requested:	$49,958.20
Matching Funds:	$49,958.20
Source of Matching Funds:	Utah LTAP

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