Analysis, Modeling, and Simulation (AMS) Case Studies of Connected and Automated Vehicle (CAV) Implementations Specific to the South Central Region

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Project No. 19ITSLSU06

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Conducting a broad stakeholder survey, basic crash analysis, and small-scale AMS case study to promote and assist successful CAV deployment

Connected and automated vehicles (CAVs) offer potentially transformative and far-reaching impacts to the transportation system. However, realized benefits will be directly tied to how well agencies prepare for these technologies. The original intent of this study was to conduct analysis, modeling, and simulation (AMS) case studies of CAV deployment strategies of importance and specific to the South Central region. The study has been expanded to better coordinate and assist with initiatives led by the Louisiana Department of Transportation and Development's (LaDOTD's) "CAV Technology Team". This expansion includes conducting a broad stakeholder survey (with accompanying analysis) to inform engagement activities in developing strategic partnerships for CAV deployment. A basic crash analysis of select CAV case studies (as chosen by the Team and documented in their CAV Action Plan) will also be conducted.

Background

Connected and automated vehicle (CAV) technologies offer potentially transformative and far-reaching impacts to the transportation system—and other associated, reliant fields. This may include impacts to public safety, congestion, personal mobility, land use, pollution and the environment, socio-economic characteristics, and the economy. However, realized benefits will be directly tied to how well public agencies prepare for these emerging technologies, including their ability to involve and coordinate across disciplines and governing bodies.

In mid-2015, the Louisiana Department of Transportation and Development (LaDOTD) created an internal, multidisciplinary task force, the "CAV Technology Team". The Team is currently developing working knowledge of CAV technology, defining agency roles in deployment, and beginning substantive planning efforts.

The original intent of this study was to conduct analysis, modeling, and simulation (AMS) case studies of CAV deployment strategies of importance and specific to the South Central region. However, the study has been expanded to better coordinate with the Team's initiatives—and to supplement, improve, and better focus their planning efforts. This includes a variety of technical tasks: conducting a broad stakeholder survey to inform LaDOTD engagement activities in developing strategic partnerships for successful CAV deployment, conducting a crash analysis on select CAV case studies, and conducting a small-scale AMS CAV case study.

Each task will be prepared as to benefit other local and state DOTs involved in similar CAV activities.

Project Summary

Each technical task is summarized below:

Stakeholder Survey: An electronic survey will be disseminated to a diverse set of Louisiana organizations to: (1) initially engage these organizations under the context of CAV planning, (2) gauge their awareness and perception of CAV technologies, likelihood of impacts, and importance of preparing for such technologies, and (3) identify areas requiring further action (e.g., identifying organizations to be involved in LaDOTD activities, identify organizations where education is warranted, etc.).

Crash Analysis: A crash analysis will be conducted on a specific CAV deployment scenario to be selected by the Team. The main objective is to determine scenarios that are "good" candidates for the respective CAV mitigation strategy (i.e., will improve key safety performance indicators).

AMS Case Study: A small-scale AMS case study of CAV deployment strategies of importance and specific to the South Central region will be conducted. It is envisioned that the AMS case study will comprise of a corridor-level analysis, that of a "typical" microscopic analysis. It is envisioned that specialized CAV logic will be coded into an existing traffic simulation model. If applicable, the AMS case study will correspond to the case study selected for the crash analysis.

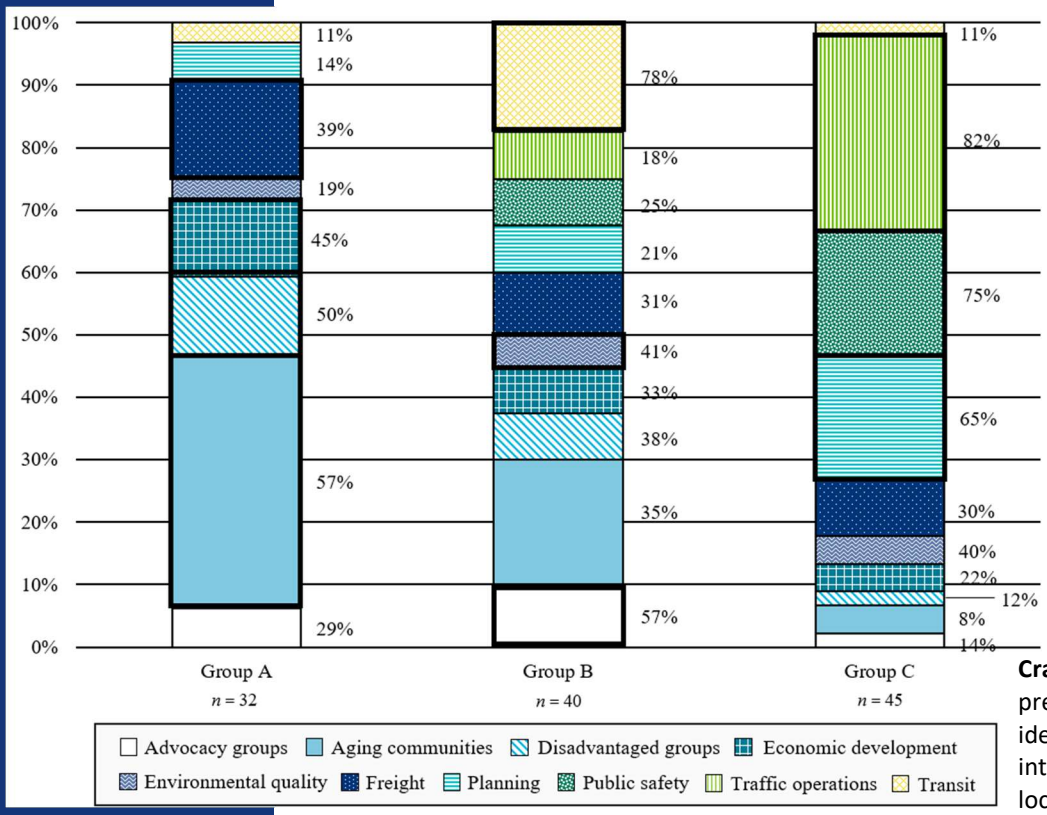

Figure 1. Composition of survey responses in three main groups (clusters) by functional category.

Status Update

Stakeholder Survey: A survey was disseminated to a wide-range of Louisiana organizations whose purview may be impacted by CAV technologies, including: advocacy groups, aging communities, disadvantaged groups, economic development, environmental quality, freight, planning, public safety, traffic operations, and transit entities. 117 organizations completed the survey and their responses were clustered in three main groups:

- Group A: those uninformed of CAV technologies and do not believe their organization will be impacted;
- Group B: those more informed of CAV technologies but still do not believe their organization will be impacted; and
- Group C: those well informed, perceive CAV technologies positively, and believe it is important to prepare.

Figure 1 shows the composition of each group by functional category. Stated percentages represent the portion of participants from the respective category within that group, and a bolded border indicates the group each category primarily resides within.

Generally, results were as expected (e.g., aging communities and disadvantaged groups primarily reside within Group A). However, low awareness and perception by economic development, freight, and transit groups indicate a potential area of concern. This is further compounded by the low levels of perceived impact and importance of CAV planning by freight and transit operations. Another key finding was the strong relationship between stated levels of awareness and perception.

Survey results were furthered analyzed in the context of a CAV-specific capability maturity model—with a focus on the collaboration dimension. Recommendations were developed to inform engagement activities a public agency may pursue in order to develop strategic partnerships in the context of CAV deployment. A paper detailing the development, results, and analysis of the survey has been prepared.

Crash Analysis: The Team is currently preparing a "CAV Action Plan" which identifies specific CAV deployments of interest to LaDOTD. The Plan proposes five locations to implement queue warning systems. A crash analysis will be conducted at each proposed location—using past crash history (from the LaDOTD Highway Crash List) and LaDOTD-defined methodology—to determine if rear-end crashes and high crash severity are "overrepresented" (i.e., if queue warning would be a "good" candidate at these locations).

AMS Case Study: Previously developed, LA-based microsimulation models were identified and reviewed. These models were not utilized in the study due to their limited scope or insufficient calibration. The research team will model a queue warning implementation along I-10 in Baton Rouge, LA using the base model developed in Tran-SET Project No. 17ITSLSU09.

Tran-SET

Tran-SET is Region 6's University Transportation Center. It is a collaborative partnership between 11 institutions (see below) across 5 states (AR, LA, NM, OK, and TX). Tran-SET is led by Louisiana State University. It was established in late November 2016 "to address the accelerated deterioration of transportation infrastructure through the development, evaluation, and implementation of cutting-edge technologies, novel materials, and innovative construction management processes".

Learn More

To learn more about this project, please feel free to contact Chris Melson (cmelson1@lsu.edu) or visit the project website: melsatron.com/ca-la.