ANALYSIS, MODELING, AND SIMULATION (AMS) TOOLS FOR CONNECTED AND AUTOMATED VEHICLE (CAV) APPLICATIONS

Developing and validating model logic/algorithms for a selected set of CAV applications and conducting real-world case studies to better understand their impacts and inform implementation.

BACKGROUND

CAV technologies offer potentially transformative societal impacts—including significant mobility, safety, and environmental benefits. The Federal Highway Administration (FHWA) has led the development, research, and standards-making of these technologies, and is currently developing deployment approaches and guidance.

Deploying CAV applications require transportation agencies to quantify effectively and fully the impacts of such implementations, and to identify which application best addresses their unique transportation problem. However, current traffic analysis and planning tools are not well suited for evaluating CAV applications because of their inability to incorporate vehicle connectivity and automated features. It is necessary to adapt and re-engineer the existing set of tools available to agencies, validate these models/tools, and provide a mechanism to share these models/tools with public agencies.

To this end, FHWA initiated an effort to develop AMS tools for CAV applications and to conduct realistic case studies with these tools to help inform implementation and estimation of benefits.

STUDY OBJECTIVES

This project began in October 2017. The two primary tracks and focuses of the project are to:

1. Develop and validate model logic/algorithms for a selected set of CAV applications.

2. Conduct real-world case studies (practical implementation scenarios and real-world transportation networks) for a selected set of freeway-based CAV applications.

STUDY DESCRIPTION

Developing Model Logic/Algorithms

The project team will work with a variety of stakeholders—model developers, model users (State/local agencies and other practitioners), academia, and users and developers of CAV technology—to determine a selected set of CAV applications where validated model logic/algorithms are needed the most. For each of the CAV applications selected, the project team will:

- Create detailed data requirements for model development.
- Construct a comprehensive model development plan.
- If additional data is needed for model development and/or validation, make a data collection plan.

After these documents are prepared, two CAV applications will ultimately be chosen for model development, carefully considering: importance to the stakeholders, prevalence of model after development, feasibility of data requirements, timing and availability of required data, feasibility of collecting additional data, and other factors.

Each developed model component will be validated in a use case and publicly disseminated to practitioners. A report documenting the model, its development, and its validation will be published and disseminated.

Conducting Case Studies

As with the development of model logic/algorithms, the project team will work closely with a variety of stakeholders to select a series of case studies to conduct, carefully considering: their importance to the stakeholder group, commitment from the specific State/local agency at the selected site, availability of existing network data, type of facility, ability to draw broader conclusions, among others. These potential case studies may include CAV AMS components of current or recently completed FHWA-led projects.

For each selected case study, the project team will create detailed case study descriptions.

A subset of these selections (three test sites) will ultimately be chosen for analysis. For each selected case study, a report will be prepared and published. During the execution of the case studies, the project team will consistently interact with State and local agencies, helping ensure the case study assumptions are consistent with stakeholder needs and expectations.

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SUPPORTING EFFORTS

This project is part of a larger effort to provide necessary, adequate, and validated CAV-aware AMS tools to practitioners. It will utilize the AMS framework currently being developed in "Development of an Analysis/Modeling/Simulation (AMS) Framework for V2I and CV Environment".[1] A simplified framework is shown in figure 1.

This project will build-out model components identified in the framework, address current AMS gaps related to CAV technology, while fulfilling the needs/requirements of the users.

REFERENCES

1. FHWA Factsheet (2017). "Analysis, Modeling, and Simulation (AMS) Framework for Connected and Automated Vehicle (CAV) Applications". In production.
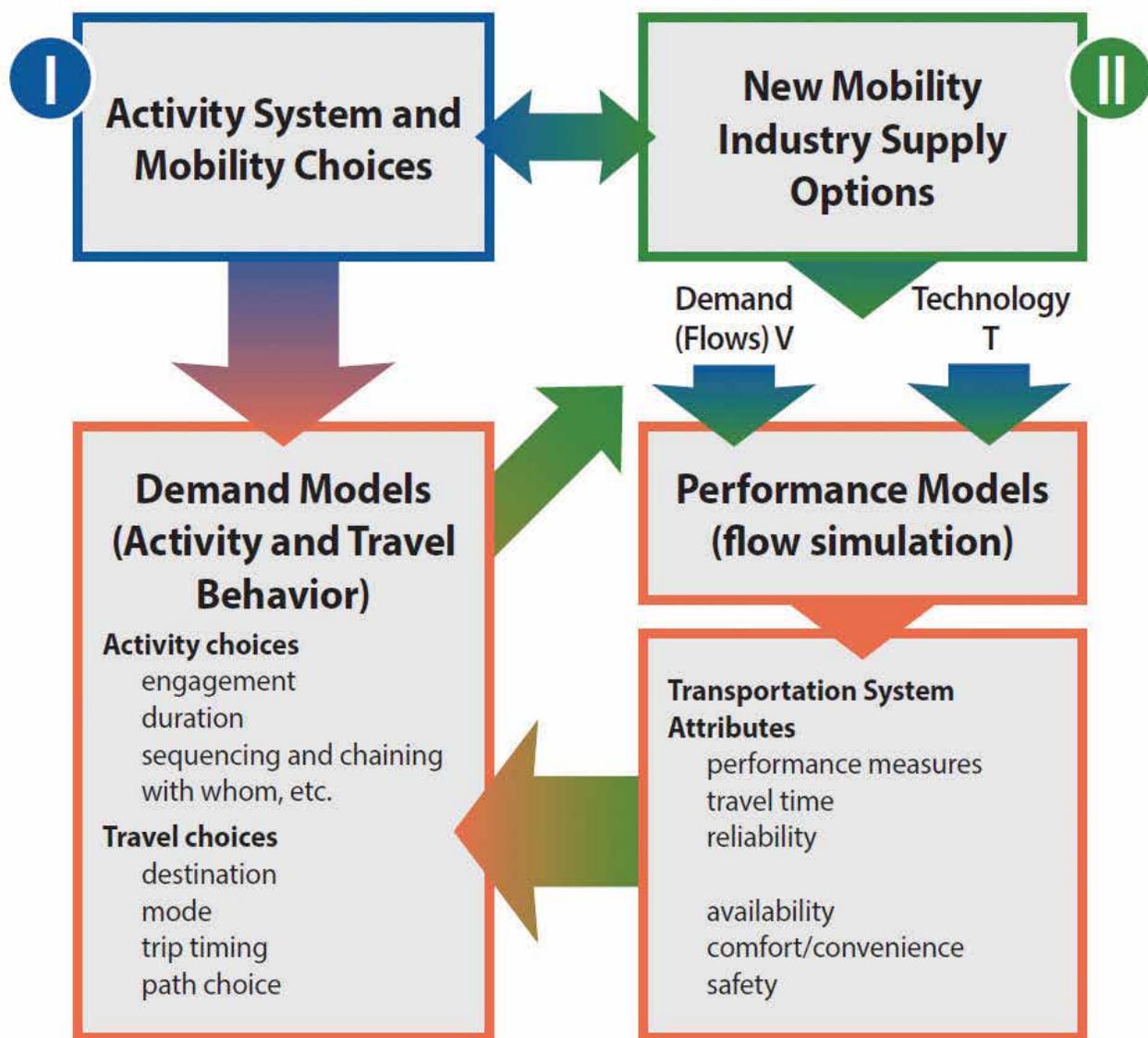
Figure 1. Methodological framework for network- and system-level assessment of CAV impacts. (Source: FHWA).[1]

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