RESEARCH SPOTLIGHT

MDOT Project Manager

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Protocol manual helps guide traffic modeling projects

To help evaluate the impacts of design alternatives for complex transportation projects, planners and engineers at the Michigan Department of Transportation (MDOT) use traffic modeling software, including a powerful microsimulation modeling program called VISSIM. Researchers developed a Michigan-specific protocol manual that guides the model development steps for VISSIM, providing clear procedures for both contractors and MDOT staff.

PROBLEM

As transportation engineers and planners weigh the impacts of proposed projects, they often use traffic simulation modeling software to help assess how different design alternatives will affect the flow of traffic. MDOT has been a leader in using macrosimulation – a high-level planning tool that simulates regional or network-level impacts. As traffic operations have grown more involved, MDOT has also turned to micro-simulation, which provides more detailed roadway-level modeling. MDOT uses a microsimulation program called VISSIM to help evaluate the impacts of complex projects, including active traffic manage-ment strategies, multi-modal projects and designs for an array of interchange types.

VISSIM is a powerful, sophisticated tool. It requires labor-intensive efforts to collect appropriate data sets and to construct a properly calibrated and validated model

VISSIM uses aerial images to help planners, engineers and stakeholders visualize the traffic impacts of transportation projects.

that will accurately convey the impacts of various alternatives. In Michigan, this work is typically performed by a consultant with oversight from MDOT. At many points in the process, assumptions must be clarified and agreed upon between MDOT and the consultant to ensure that the final product meets expectations.

Initially, MDOT had no standard procedures for consultants to follow for VISSIM model development or deliverables. Without clear guidelines, early work with VISSIM modelers resulted in inconsistent assumptions, lengthy MDOT reviews and

reworked tasks. Budgets and schedules were strained. MDOT needed a protocol manual that could guide both consultants and MDOT reviewers effectively from project scoping to the final deliverable.

RESEARCH

This project's goal was to develop a VISSIM protocol manual specific to MDOT through an examination of similar manuals from other state agencies that use microsimulation modeling. Researchers sought to identify best practices and use them as the foundation for the MDOT protocol manual.

The research team reviewed 15 documents sourced from 10 state agencies and the Federal Highway Administration (FHWA). Each agency's manual provided structure and guidance for microsimulation traffic analysis projects, with variations due to agencies' internal differences. Based on universal themes found across many documents, researchers identified several key sections to include in the MDOT manual:

- Project understanding and scoping
- Data collection and development
- Model development
- Model calibration and validation
- Reporting and documentation
- Model reviewing and result evaluation

Researchers and MDOT staff met many times; they used their combined experience with VISSIM to select the appropriate practices to include in Michigan's protocol manual. Decisions were influenced by how frequently a practice was cited as well as its adherence to FHWA guidance, ease of implementation, and ability to streamline the model development process.

RESULTS

The MDOT VISSIM Protocol Manual is divided into two sections. Section 1 focuses on assisting MDOT project managers in determining whether VISSIM is the appropriate analysis tool for the project, defining the project scope, and understanding microsimulation milestones and deliverables. Section 2 provides guidance on model development and review processes, addressing the following topics:

- **Geographic and temporal scope:** The physical boundaries of the area and the range of time periods to be modeled must be clearly defined.
- **Data collection:** Traffic counts and site visits are typical sources of information. If possible, data should be collected on the same day at all locations throughout the study area.
- **Model development:** The manual provides guidance for key parameters and inputs, including MDOT's preferred approaches for modeling traffic composition (cars vs. large trucks), speeds, and driver behavior.
- **Calibration and validation:** The draft model should be calibrated to ensure that it replicates local traffic conditions as closely as possible. The manual provides validation criteria for two key measures of efficiency: traffic volumes and speed/travel times.
- **Evaluating models:** Graphical and tabular presentations of measures of efficiency should be produced to convey model results to reviewers.
- **Documentation and deliverables:** VISSIM project deliverables include electronic modeling files, technical memoranda that allow MDOT to review analysis methodology before the final report is drafted, and a final report.
- **Tools and checklists:** The manual includes nine templates and checklists

to help standardize the model development process.

IMPLEMENTATION

The MDOT VISSIM Protocol Manual became available for use in January 2020, and MDOT has already seen the benefits of a clearer and more streamlined process for new projects. To help users learn about the manual, the researchers produced two informational webinars: one for MDOT staff and another addressing members of the consulting community.

Research Administration

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This final report is available at
mdotjboss.state.mi.us/ SpecProv/getDocumentById. htm?docGuid=3ede788d-82df-4a0e-bbb5-691da5eafcf4.

The MDOT VISSIM Protocol Manual is available at
mdotjboss.state.mi.us/ SpecProv/getDocumentById. htm?docGuid=26effbf7-d57b-4aea-af6d-74e23ea837c5.