

# RESEARCH SPOTLIGHT

## Project Information

**REPORT NAME:** Development of a Network Level Evaluation Tool for Managing ITS Infrastructure

**START DATE:** May 2019

**REPORT DATE:** March 2021

**RESEARCH REPORT NUMBER:** SPR-1700

**TOTAL COST:** \$465,450

**COST SHARING:** 20% MDOT, 80% FHWA through the SPR, Part II, Program

## MDOT Project Manager



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## ITS evaluation tool calculates value and impact of highway technology

For decades, the Michigan Department of Transportation (MDOT) has been using intelligent transportation system (ITS) technology along the nearly 10,000 miles of highway it oversees. This system includes devices such as closed-circuit television cameras, environmental sensor stations, and dynamic message signs. To manage these assets, understand the advantages each provides and evaluate the potential of proposed ITS projects, MDOT sought a method to assess which devices most effectively improve safety and decrease delays on state highways. This project developed a methodology and tool to help MDOT compare the different technologies for improved planning and decision-making capabilities.

### PROBLEM

For 30 years the Federal Highway Administration's Intelligent Transportation Systems Joint Program Office has been working to accelerate the development and use of ITS technologies to enhance mobility, safety and efficiency in the nation's transportation system. Managing more than 10,000 miles of highway, MDOT



Dynamic message signs are one element of MDOT's ITS statewide network. They rapidly convey important information about unexpected or changing conditions.

has been an early and active participant, adopting, installing and promoting ITS devices and programs across the state. Some of the most heavily travelled corridors in Michigan are well-equipped with ITS devices, including closed-circuit TV cameras,

vehicle detection stations, environmental sensor stations, dynamic message signs, and other data collection and transmission devices. These technologies are designed to enhance safety and decrease travel delays on highways.

*“The methodology developed through this research is an important step in the ability to compare intelligent transportation system projects and deployments in a common framework.”*

**Joe Gorman, P.E.**  
Project Manager

There is a wide range of additional ITS devices and applications that could be installed on state highways, and MDOT is faced with the challenge of integrating new and existing technologies while ensuring statewide compatibility. As the systems become more complex, MDOT must manage its existing assets while making sound ITS investment decisions.

To objectively compare projects and identify any opportunity to better leverage existing assets, MDOT wanted a data-backed performance evaluation tool it could apply to ITS systems already in place, as well as proposed new projects.

## RESEARCH

This research sought to define the parameters and capabilities of MDOT’s current ITS network, to evaluate existing system performance and to develop an evaluation methodology and tool to make the task of assessing and comparing different types of devices and projects more consistent across the state.

Researchers began by identifying the data needed to make accurate calculations and how the information could be obtained. To accomplish this, the team first had to document and inventory the devices that are part of MDOT’s current ITS network and quantify the safety and delay performance of each device.

Paring MDOT’s database of 29,000 ITS devices down to those relevant to this project, the team eliminated equipment such as switches and utility poles to reduce the list to 2,832 devices in 11 categories. The researchers then devised a methodology to compare the costs of traffic delays and crashes, and the time-savings and safety improvements the devices supply. The team included a variety of data such as road classification, speed limit, traffic volume, delay, congestion, and crash history information, allowing MDOT to uniformly assess a device’s performance across various regions and project types.

## RESULTS

Combining the methodology with input from MDOT staff, national research and case studies, the researchers developed a software tool to make calculating the costs and benefits of ITS projects simple.

Designed as an extension of MDOT’s existing geospatial tools, this new product allows staff already familiar with those resources to easily incorporate it into their work. The research team also created an accompanying installation and user’s guide to facilitate quick adoption, as well as guidance for continuous updates and maintenance.

Applying the new methodology to MDOT’s ITS network already in place, the research team was able to show that traffic delays cost Michigan about \$1.3 billion per year, and an average of \$3.9 billion per year in property damage, injuries and fatalities resulting from crashes. The ITS devices MDOT currently uses mitigate those annual costs by about 18.6 percent and 4.5 percent, respectively.

To start, the ITS evaluation tool will be part of a pilot implementation effort while MDOT examines and weighs a number of potential statewide ITS projects.

## VALUE

The new methodology compares the benefits and costs of existing and proposed

ITS devices on Michigan’s extensive highway network, empowers MDOT to choose new ITS projects that promise the greatest value and identifies opportunities to maximize devices already installed.

As it is used throughout the state, the methodology and tool will be used to help regional planners continue to improve roadway safety and reduce traffic delays, and allow MDOT to make better-informed ITS project decisions within a complex system based on robust data.

## Research Administration

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**This final report is available online at**

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