

## TENNESSEE DEPARTMENT OF TRANSPORTATION PARTNERS WITH STATE UNIVERSITIES TO ENHANCE TSMO RESEARCH, COMMUNICATION AND INNOVATION

By: Tennessee Department of Transportation

### IN THIS CASE STUDY YOU WILL LEARN:

1. How the Tennessee Department of Transportation leveraged the resources of universities to enhance TSMO research, communication and innovation in the state.
2. How TDOT and the universities developed strategies for improving standardization of maintenance procedures in different jurisdictions.
3. How TDOT and the universities work together to survey traffic management stakeholders and develop and disseminate important information.



### BACKGROUND

Tennessee Department of Transportation (TDOT) works closely with the state's major universities and considers them partners in research and innovation through an array of diverse programs and research projects. TDOT's Transportation System Management and Operation (TSMO) goal is to optimize existing operations and infrastructure capabilities and provide a safe, efficient, and reliable transportation system. To this end, TDOT established a number of programs in conjunction with universities.



### EXAMPLES OF THESE INCLUDE:

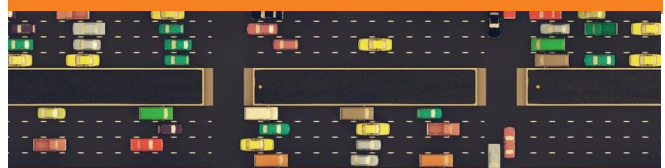
#### Tennessee Transportation Assistance Program (TTAP)



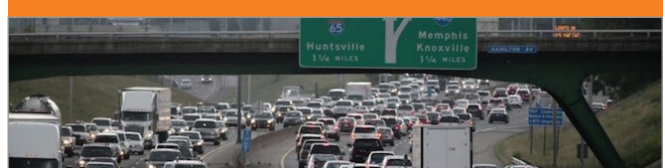
#### Traffic Signal Academy (TSA) Tennessee Traffic Signal Users Group (TTSUG)



#### Tennessee Model Users Group (TNMUG)



#### TennSMART



#### Distance Education for MSc in Civil Engineering at the University of Tennessee

Through these initiatives, TDOT has successfully harnessed a multitude of technical expertise and research capabilities at various

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universities to advance its goal in improving safety, efficiency, reliability, and service in general.

This case study highlights the benefits of collaborations between TDOT and the universities for the enhancement of traffic signal operations and management in the state of Tennessee.

## THE ISSUE

Improving the performance of signalized intersections has been a top priority for TDOT's Traffic Operations Division. There are approximately 6,000 traffic signals in the State of Tennessee. As with many states, TDOT does not typically own, operate, nor maintain those traffic signals. They are usually owned by local governments, sometimes with inconsistent levels of maintenance. Smaller agencies tend to lack resources and technical expertise and typically rely on contractors to service their signalized intersections. Some agencies try to address signal maintenance using employees who also serve a wide variety of other public works or street maintenance responsibilities. Unfortunately, it is common in some smaller agencies for signals to "run to failure," they get maintenance attention.

To better maintain and optimize the performance of the traffic signal infrastructure, TDOT has partnered with several universities in Tennessee to provide up-to-date training to local agencies, foster collaborations, promote technology information sharing among transportation professionals, and advance signalized intersection performance evaluation technologies through Traffic Signal Academy, Tennessee Traffic Signal Users Group, and TDOT's University Research Program.



## TRAFFIC SIGNAL ACADEMY

Considering the needs for traffic signal technology professionals at many local agencies, the University of Tennessee (UT) Center for Transportation Research (CTR) established the Traffic Signal Academy (TSA) in 2012 with the support from TDOT. The Signal Academy is part of the Tennessee Transportation Assistance

Program (TTAP), which is financed jointly by the Federal Highway Administration (FHWA), TDOT, and the University of Tennessee (UT).

The Signal Academy offers a series of six day-long workshops designed to cover traffic signal standards, signal timing plans, vehicle detection, advanced operations, traffic signal controller programming, and traffic signal installation and maintenance, all geared to provide comprehensive traffic signal training to local agencies. The Signal Academy also goes beyond the classroom and offers advanced technical expertise to local agencies.

The Traffic Signal Academy held its first class in 2012 and as of 2019 has trained more than 1,500 attendees from over 40 consulting firms, local, state, and federal agencies within Tennessee as well as entities from 20 other states. The FHWA Arterial Management Program recognizes the Signal Academy as a national training source.

## TENNESSEE TRAFFIC SIGNAL USERS GROUP

TDOT established the Tennessee Traffic Signal Users Group (TTSUG) in 2016 to facilitate and coordinate communications and technical exchanges among local agencies. Since its formation, the Users Group has actively engaged with local agencies via a series of need and practice surveys and face-to-face meetings. The group identified operation and maintenance training and funding as primary issues. The group also recognized the lack of standardized traffic signal management as a problem. The group proposed developing a mentoring program pairing large agencies with smaller ones to share knowledge and best practices, and using some funding for agencies with small maintenance signal projects to upgrade existing infrastructure.

The Traffic Signal Users Group partners with universities, specifically the UT's Center for Transportation Research, to share resources and further address technical challenges and real-world concerns. Local agencies are encouraged to take advantage of the Traffic Signal Academy workshops. For agencies with limited or no staff training budget, the Users Group works with the Signal Academy and develops free online training webinars to address some of the core technical needs of those agencies. The Signal Academy is furthering this online training service by developing a web-based Traffic Signal Asset Management System (TSAMS) for the State of Tennessee to inventory and track the state-of-the-practice of traffic signal infrastructure in Tennessee. With this web-based database, local agencies will be able to catalog traffic signal infrastructure and document maintenance activities regularly. The routine management and comprehensive knowledge of the traffic signal system will help TDOT allocate their funding and be better prepared in deploying new traffic signal technologies.

Tennessee Traffic Signal Users Group has provided an excellent platform for TDOT to communicate with local agencies responsible for traffic signal maintenance throughout the State. The Users Group has helped build cooperative relationships between agencies of different sizes and academia, all with mutually beneficial results.

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## TDOT UNIVERSITY RESEARCH PROGRAM

For decades, TDOT has contracted with universities to conduct various research through TDOT's Research Program. Combining innovative ideas and practical needs, TDOT partners with university researchers to develop, pilot, and implement technological solutions. Recognizing that signal timing plans and operational performance of many of the State's traffic signals have not been thoroughly evaluated and updated on a continuing, systematic, and standardized basis since their initial installation, TDOT is partnering with domain experts in traffic signal and Big Data through its University Research Program.

The study takes advantages of crowdsourced real-time traffic data, i.e., WAZE Connected Citizens Program that that TDOT participates

encourages and facilitates the communications and information sharing among local traffic agencies and traffic engineers. With strategic funding through its University Research Programs, TDOT guides research directions in the State by contracting with universities and use emerging crowdsourced data to automate the performance assessment workflow for the State's vast traffic signal systems. These thriving partnerships with our state's universities will be essential to addressing the challenges to come with the shifting mobility paradigm of the future.



in, and developed a pilot tool for TDOT to objectively, inexpensively, and systematically evaluate the State's thousands of traffic signals and prioritize the remedial actions for the underperforming cases. This is just one example of how TDOT's University Research Program helps establish a partnership with university researchers. The success of this partnership is expected to provide TDOT with the added capability to better gauge the overall performance of the state's signalized intersections using cutting-edge technologies. Local agencies and metropolitan planning organizations can also benefit from having an objective and systematic tool for assessing and improving their traffic signal infrastructure.

## OUTCOMES AND BENEFITS

TDOT draws from the technical expertise and research capabilities of major Tennessee universities in different ways to achieve its Transportation System Management and Operation (TSM&O) goals. This case study highlights how collaborations and partnership between TDOT and universities can improve traffic signal operations and management. The Traffic Signal Academy, established with the support from TDOT, has served over 1,500 technical staff and engineers from dozens of Tennessee agencies and consultant firms as well as from 20 other states. The Tennessee Traffic Signal Users Group, building on the success of the Traffic Signal Academy,

## FURTHER INFORMATION

NOCoe Knowledge Center: <https://transportationops.org/knowledge-center>