Organizing for TSMO

Case Study 4: Culture – Changing the Culture Towards TSMO in State Departments of Transportation

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16. Abstract

Given the varying stages of TSMO adoption and advancement, the Federal Highway Administration identified the need for case studies to provide examples of common challenges and best practices for transportation agencies to learn from each other. This is one of 12 case studies developed to support organizing for TSMO. This case study focuses on how improving the TSMO culture in an agency can support development of a TSMO program.

Five agencies who worked to improve the TSMO culture in their agency were interviewed: Colorado Department of Transportation (CDOT), Florida Department of Transportation (FDOT) District 4 (D4), Iowa Department of Transportation (IowaDOT), Michigan Department of Transportation (MDOT), and Washington State Department of Transportation (WSDOT). Each agency provided information on how they improved their TSMO culture, their lessons learned, and the next steps to continually improve these efforts.

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List of Abbreviations and Acronyms

AASHTO ....American Association of State Highway and Transportation Officials
CDOT...Colorado Department of Transportation
CMM.. Capability Maturity Model
D4...District 4
FDOT .... Florida Department of Transportation
FHWA...Federal Highway Administration
IowaDOT ....Iowa Department of Transportation
ITS.. Intelligent Transportation Systems
MDOT... Michigan Department of Transportation
MPO..Metropolitan Planning Organization
SHRP2... Strategic Highway Research Program 2
TRB...Transportation Research Board
TSMO .... Transportation Systems Management and Operations
WSDOT .... Washington State Department of Transportation

EXECUTIVE SUMMARY

Transportation systems management and operations (TSMO) provides tools for transportation managers to address safety, system performance, and reliability. TSMO is "an integrated set of strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system.[1]" Through participation in the second Strategic Highway Research Program (SHRP2) workshops, transportation agencies are working to better support TSMO programs. Deploying intelligent transportation systems (ITS), hiring internal information technology staff, and using performance measures for data-driven decisions are just a few examples of many opportunities that a TSMO program can support.

Given the varying stages of TSMO adoption and advancement, the Federal Highway Administration identified the need for case studies to provide examples of common challenges and best practices for transportation agencies to learn from each other. This is one of 12 case studies developed to support organizing for TSMO. This case study focuses on how improving the TSMO culture in an agency can support development of a TSMO program.

Five agencies that worked to improve their TSMO culture were interviewed: the Colorado Department of Transportation (CDOT), the Florida Department of Transportation (FDOT) District 4 (D4), the Iowa Department of Transportation (IowaDOT), the Michigan Department of Transportation (MDOT), and the Washington State Department of Transportation (WSDOT). Each agency provided information on how they improved their TSMO culture, their lessons learned, and the next steps to continually improve these efforts. Some of the best practices identified include:

- CDOT's integration of a TSMO evaluation into existing agency processes requires staff to assess safety, operations, and ITS in project scoping. This activity has promoted agency culture by providing transparency to agency TSMO goals and objectives.
- FDOT D4's multi-discipline and multi-agency approach to integrating TSMO into existing planning and project development processes to improve TSMO culture region-wide.
- IowaDOT's educational website promotes TSMO culture for the entire State by providing access to State TSMO plans, national resources, and general education.
- MDOT's five TSMO business cases express the value of TSMO to a variety of audiences, using TSMO language that resonates with each audience respectively.
- WSDOT's educational TSMO website facilitates an enhanced TSMO culture within the agency and in partner agencies by effectively communicating the "why-when-how" of TSMO.

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[1] Source: https://ops.fhwa.dot.gov/tsmo/index.htm

CHAPTER 1 – INTRODUCTION

Historically, transportation agencies have managed congestion primarily by funding major capital projects that focused on adding capacity to address physical constraints such as bottlenecks. Operational improvements were typically an afterthought and considered after the new infrastructure was already added to the system. Given the changing transportation landscape that includes increased customer expectations, a better understanding of the sources of congestion, and constraints in resources, alternative approaches were needed. Transportation systems management and operations (TSMO) provides such an approach to overcome these challenges and address a broader range of congestion issues to improve overall system performance. With agencies needing to stretch transportation funding further and demand for reliable travel increasing, TSMO activities can help agencies maximize the use of available capacity and implement solutions with a high benefit-cost ratio. This approach supports agencies' abilities to address changing system demands and be flexible for a wide range of conditions.

Effective TSMO efforts require full integration within a transportation agency and should be supported by partner agencies. This can be achieved by identifying opportunities for improving processes, instituting data-driven decision making, establishing proactive collaboration, and performing activities leading to development of performance optimization processes.

Through the second Strategic Highway Research Program (SHRP2), a national partnership between the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the Transportation Research Board, (TRB), a self-assessment framework was developed based on a model from the software industry. SHRP2 developed a framework for agencies to assess their critical processes and institutional arrangements through a capability maturity model (CMM). CMM uses six dimensions of capability to allow agencies to self-assess their implementation of TSMO principles[1]:

1. Business processes – planning, programming, and budgeting.
2. Systems and technology – systems engineering, systems architecture standards, interoperability, and standardization.
3. Performance measurement – measures definition, data acquisition, and utilization.
4. Culture – technical understanding, leadership, outreach, and program authority.
5. Organization and workforce – programmatic status, organizational structure, staff development, recruitment, and retention.
6. Collaboration – relationships with public safety agencies, local governments, metropolitan planning organizations (MPO), and the private sector.

Within each capability dimension, there are four levels of maturity (performed, managed, integrated, and optimized), as shown in Figure 1. An agency uses the CMM self-assessment to

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[1] FHWA, Office of Operations, "Organizing for Reliability – Capability Maturity Model Assessment and Implementation Plans Executive Summary," May 2015. https://ops.fhwa.dot.gov/docs/cmmexesum/sec1.htm

identify their level of maturity in each dimension, determine their strengths and weaknesses in each dimension, and determine actions they can take to improve their capabilities.
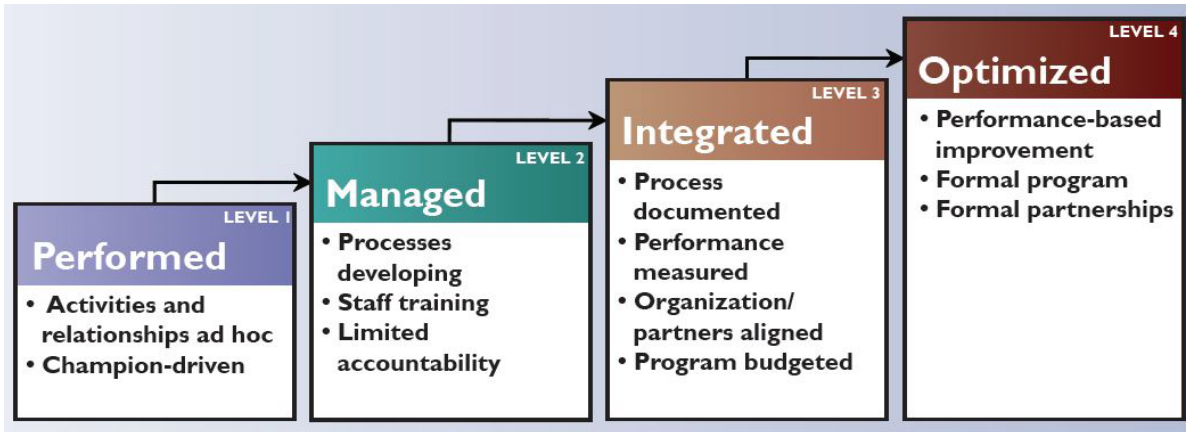

Figure 1. Chart. Four Levels of Maturity

Source: Creating an Effective Program to Advance Transportation System Management and Operations, FHWA Jan 2012

Purpose of Case Studies

In the first 10 years of implementation of the TSMO CMM, more than 50 States and regions used the tool to assess and improve their TSMO capabilities. With the many benefits experienced by these agencies, FHWA developed a series of case studies to showcase leading practices to assist other transportation professionals in advancing and mainstreaming TSMO into their agencies. The purposes of the case studies are to:

- Communicate the value of changing the culture and standard practices towards TSMO to stakeholders and decision-makers.
- Provide examples of best-practices and lessons learned by other State and local agencies during their adoption, implementation, and mainstreaming of TSMO.

These case studies support transportation agencies by showing a wide range of challenges, opportunities, and results to provide proof for the potential benefits of implementing TSMO. Each case study was identified to address challenges faced by TSMO professionals when implementing new or expanding existing practices in the agency and to provide lessons learned.

Identified Topics of Importance

A TSMO-focused culture is the backbone for success in all other TSMO components. The agencies highlighted for this case study improved their TSMO culture through consistent collaboration, outreach, training, and enhancing other CMM dimensions.

Interviews

Agencies were selected for each case study based on prior research indicating that the agency was excelling in particular TSMO capabilities. Care was taken to include a diversity of geographical locations and agency types (departments of transportation, cities, and MPOs) to

develop case studies that other agencies could easily relate to and learn from. Interviews were conducted with selected agencies to collect information on the topic for each case study.

Description of Culture

Creating a TSMO culture within an agency is contingent on having engaged professional staff who adopt and implement agency goals as well as consider how they can improve daily activities to meet objectives. The culture dimension of TSMO includes:

- Technical understanding.
- Leadership and championship.
- Outreach.
- Program authority.

Senior leadership determines the level of TSMO outreach and education. Goals, expectations, education, and objectives are defined for all applicable staff members. For example, executives of State departments of transportation would provide TSMO guidance and information to all members involved in project planning, development, safety, construction, operations, and maintenance. Communication of TSMO, both internally and with partner agencies, is essential to the program's success.

The business case for TSMO in an agency or across a region is defined during development of strategic business plans and includes reasoning for why TSMO is important and how it will mitigate transportation challenges. The business case should include information on benefit-to-cost scenarios, regional challenges, and the value of TSMO to regional stakeholders and travelers. It should be written in such a way that it can be shared with multiple audiences to convey the message that implementing TSMO strategies will increase productivity and efficiency more than traditional solutions alone.

Additional resources to improve TSMO culture in an organization include:

- National Operations Center of Excellence, https://transportationops.org/.
- FHWA's Primer for Program Planning, https://ops.fhwa.dot.gov/publications/fhwahop17017/fhwahop17017.pdf.
- AASHTO's TSMO Guidance, http://www.aashtotsmoguidance.org/.

CHAPTER 2 – BEST PRACTICE EXAMPLES

The Colorado Department of Transportation (CDOT), the Florida Department of Transportation District 4 (FDOT D4), the Iowa Department of Transportation (IowaDOT), the Michigan Department of Transportation (MDOT), and the Washington State Department of Transportation (WSDOT) all participated in previous second Strategic Highway Research Program (SHRP2) efforts. The capability maturity model (CMM) workshops with SHRP2 helped inform them about implementing and advancing transportation systems management and operations (TSMO) in their agencies. This chapter highlights how each agency has improved the TSMO culture in their State.

Colorado Department of Transportation (CDOT)

CDOT is composed of five regions with a largely centralized organization. CDOT manages highway facilities, including over 35 mountain passes where inclement weather poses additional challenges for safety and mobility. A TSMO division was initiated in 2015 to provide statewide programs and strategies to improve travel time reliability and safety.

TSMO Evaluation

Following the CMM assessment during SHRP2 efforts, CDOT developed or enhanced agency processes to improve their TSMO culture. Initially, the CDOT TSMO group worked to develop an "operations clearance" similar to environmental clearances, which would be required during project development. This process was provided to regional traffic groups and project managers but received some pushback from regional staff because it seemed like additional work and the benefit was not understood. To mitigate this perception, CDOT used the Lean Six Sigma methodology to modify the original operations clearance process into a TSMO project evaluation tool that effectively presented the benefits of TSMO without a large amount of additional work. With support of agency executive staff, CDOT developed a "Lean Team" that included personnel from various disciplines with responsibility for evaluating the original operations clearance process. This support from senior level management communicated the importance of TSMO and the TSMO evaluation tool to other staff. CDOT trained staff on how and when to use the TSMO evaluation tool. This tool was made up of three assessments: safety, operations, and intelligent transportation systems (ITS) and was required for scoping all projects after February 1, 2016. Once CDOT staff began using the evaluation tool in project planning, support for the TSMO program grew throughout the agency.

Various Outreach

Following the CMM assessment, the agency also provided training for numerous TSMO activities, including traffic incident management, general TSMO information, maintenance training academy, programs for highway incident commanders, and traffic management center operator training. CDOT produced TSMO newsletters and a brochure (see Figure 2) and held webinars and regional operations forums to communicate the value of TSMO and ongoing TSMO activities. These outreach materials and activities helped facilitate an improved TSMO

culture in the agency by effectively communicating information, challenges, benefits, and success stories to agency staff.

Technology

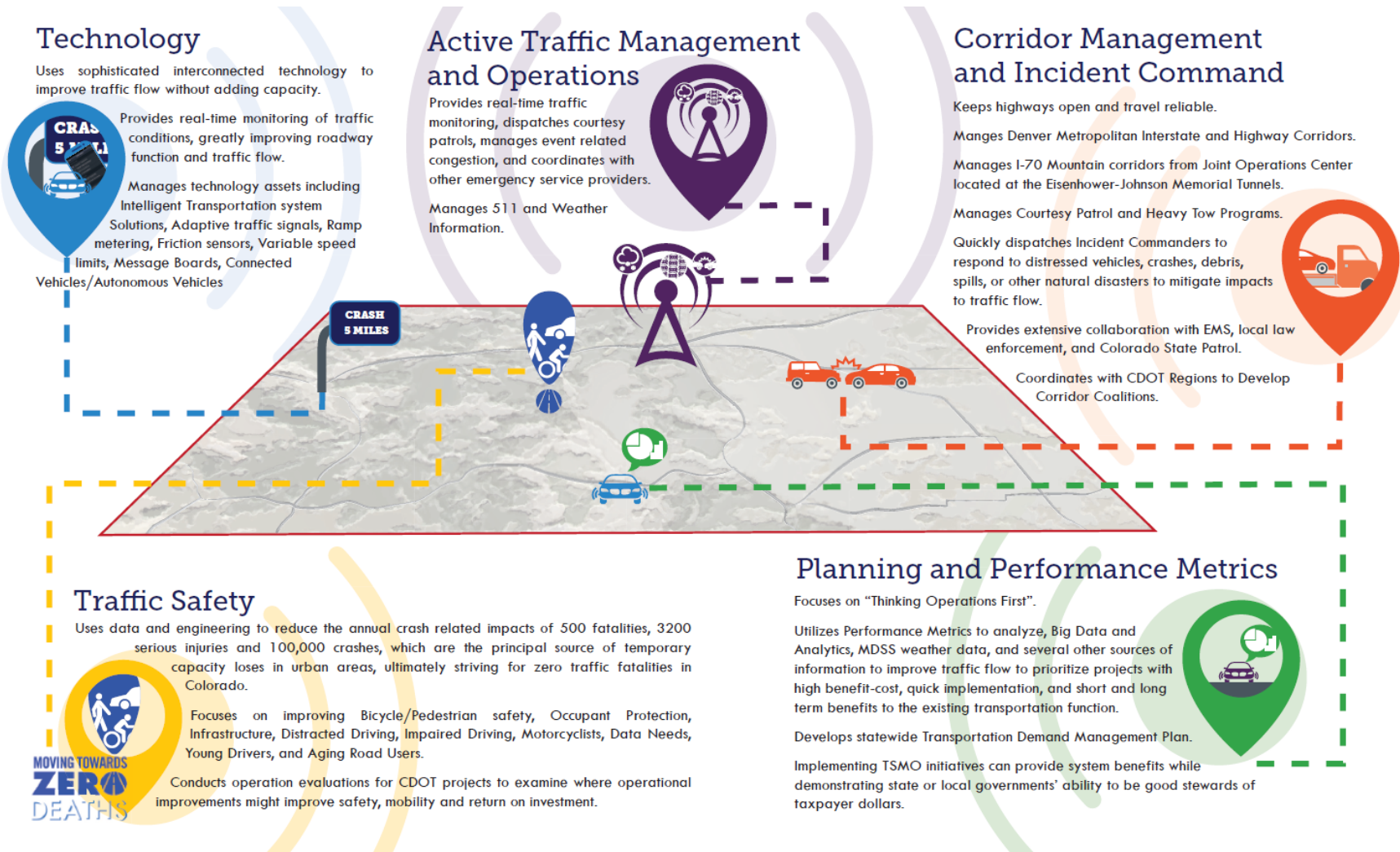Uses sophisticated interconnected technology to improve traffic flow without adding capacity.

Provides real-time monitoring of traffic conditions, greatly improving roadway function and traffic flow.

Manages technology assets including Intelligent Transportation system Solutions, Adaptive traffic signals, Ramp metering, Friction sensors, Variable speed limits, Message Boards, Connected Vehicles/Autonomous Vehicles

Active Traffic Management and Operations

Provides real-time traffic monitoring, dispatches courtesy patrols, manages event related congestion, and coordinates with other emergency service providers.

Manages 511 and Weather Information.

Corridor Management and Incident Command

Keeps highways open and travel reliable.

Manges Denver Metropolitan Interstate and Highway Corridors.

Manages I-70 Mountain corridors from Joint Operations Center located at the Eisenhower-Johnson Memorial Tunnels.

Manages Courtesy Patrol and Heavy Tow Programs.

Quickly dispatches Incident Commanders to respond to distressed vehicles, crashes, debris, spills, or other natural disasters to mitigate impacts to traffic flow.

Provides extensive collaboration with EMS, local law enforcement, and Colorado State Patrol.

Coordinates with CDOT Regions to Develop Corridor Coalitions.

Traffic Safety

Uses data and engineering to reduce the annual crash related impacts of 500 fatalities, 3200 serious injuries and 100,000 crashes, which are the principal source of temporary capacity loses in urban areas, ultimately striving for zero traffic fatalities in Colorado.

Focuses on improving Bicycle/Pedestrian safety, Occupant Protection, Infrastructure, Distracted Driving, Impaired Driving, Motorcyclists, Data Needs, Young Drivers, and Aging Road Users.

Conducts operation evaluations for CDOT projects to examine where operational improvements might improve safety, mobility and return on investment.

Planning and Performance Metrics

Focuses on "Thinking Operations First".

Utilizes Performance Metrics to analyze, Big Data and Analytics, MDSS weather data, and several other sources of information to improve traffic flow to prioritize projects with high benefit-cost, quick implementation, and short and long term benefits to the existing transportation function.

Develops statewide Transportation Demand Management Plan.

Implementing TSMO initiatives can provide system benefits while demonstrating state or local governments' ability to be good stewards of taxpayer dollars.

Figure 2. Chart. CDOT TSMO Brochure
Source: https://www.codot.gov/programs/operations/brochure/view

Florida Department of Transportation District 4 (FDOT D4)

FDOT D4 is one of seven districts in Florida. It covers five counties and spans nearly 5,000 square miles. Over 3,600,000 residents travel around 52.4 million vehicle miles daily on roads in the FDOT D4 region. This area is also served by 90 airports, three deep-water ports, and two railroads.[1] The TSMO Division of FDOT is part of the Traffic Engineering and Operations Office and is responsible for managing the State's ITS program, which facilitates mobility strategies and programs.

Regional Technical Advisory TSMO Committee

Following FDOT's involvement with SHRP2 efforts, FDOT D4 developed a TSMO regional technical advisory committee to collaborate with metropolitan planning organizations (MPO) on TSMO in the region. This committee also included regional partners from FDOT District 6, such as Miami-Dade County.

The technical advisory committee collaborated to develop an implementation plan for education and programming of TSMO projects in the region and covered varying topics for regional planning. Through this committee, FDOT D4 provides guidance to the MPO for TSMO activities so that TSMO is included in regional planning efforts and project implementation. Additional efforts are made for local discussions because funding for TSMO activities varies throughout the region.

The FDOT D4 TSMO culture has grown in part from discussions and action items developed during these collaborative committee meetings. The committee provides TSMO program updates and examples of successful projects using TSMO strategies. Presenting case studies, such as benefits received from adaptive control or managing a major event, to committee planners helps communicate regional needs and how TSMO can support cost-efficient solutions and enhance the regional TSMO culture.

TSMO Master Plan

The D4 TSMO Master Plan for Broward and Palm Beach Counties defines the first identified TSMO network in the region. This TSMO network was established using five criteria: volume-to-capacity ratios, signal density, bottlenecks, transit ridership, and crash density. The plan identifies where TSMO projects are needed, what type of projects are needed, when and how they should be implemented, and who is responsible for each phase of project development. Figure 3 from the Master Plan communicates the TSMO service areas, criteria, and solutions for regional transportation challenges.

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[1] http://www.fdot.gov/agencyresources/districts/

Service Area	Needs Criteria	Service Package	
Traffic Management	Volume/Capacity Ratio, Bottleneck, Signal Density	Network Surveillance	Emissions Monitoring and Management
		Traffic Probe Surveillance	Standard Railroad Grade Crossing
		Traffic Signal Control	Railroad Operations Coordination
		Traffic Metering	Parking Facility Management
		HOV Lane Management	Regional Parking Management
		Traffic Information Dissemination	Reversible Lane Management
		Regional Traffic Management	Speed Warning and Enforcement
		Traffic Incident Management System	Drawbridge Management
		Transportation Decision Support and Demand Management	Roadway Closure Management
		Electronic Toll Collection	Dynamic Roadway Warning

Figure 3. Chart. Excerpt from TSMO Service Areas and Criteria Table
Source: Transportation Systems Management and Operations Master Plan, FDOT D4

The first release of this master plan included descriptions to effectively define TSMO and promote the value it brings to transportation planning, design, construction, and maintenance. The agency took a simple approach when writing the document to ensure TSMO goals and objectives were effectively communicated to personnel from all disciplines. The agency noted that this approach to communication has greatly improved the agencywide TSMO culture.

A decision was made to ensure that this master plan would be mainstreamed into existing planning processes during a series of value engineering workshops by tasking the planning group, versus traffic operations, to develop the TSMO Master Plan. This approach, alongside support from district executive leadership, helped integrate the plan and facilitated an improved TSMO culture.

Looking to the Future

Based on previous efforts, FDOT D4 identified next steps to improve the TSMO culture. The district plans to update the master plan to include strategic direction from other regional transportation plans such as incident management, arterial management, managed lanes, and more. These plans will be integrated into the FDOT D4 TSMO Master Plan, which will identify how each existing plan relates to different parts of TSMO, such as organization and staffing, budgeting, business process, and more. The inclusion of these transportation plans into the TSMO Master Plan will help communicate the business case to regional partners, executive leadership, and internal staff.

In the future, FDOT D4 also plans to improve the TSMO culture by working more closely with internal partners from bridge and hydrology design, maintenance, and others. The TSMO group

recently began working with their bridge inspection group and created a proposal that considers the effect of movable bridges on maintenance, congestion, and safety. They began working with agency hydrology engineers to identify areas of frequent hydroplaning and correlating it with roadway infrastructure improvements. The cross-discipline collaboration that occurs between the TSMO group and other groups in the agency facilitates a wide understanding of the needs each group has when developing projects and promotes an improved multi-discipline understanding of TSMO. In the future, FDOT D4 intends to improve and formalize this process. The District's TSMO Program Engineer noted that it takes a lot of work to initiate and facilitate an improved TSMO culture, but it is "part of the job."

Iowa Department of Transportation (IowaDOT)

The Office of Traffic Operations is part of the Highway Division of IowaDOT. The Highway Division's responsibilities include design/planning, maintenance, construction, operations, and support of ITS technology. IowaDOT is divided into six geographical districts, each responsible for maintaining the State highway system in their respective region. IowaDOT's first TSMO plan was released in early 2016 by the Office of Traffic Operations. Since its release, IowaDOT continues to improve TSMO processes and expand their TSMO program.

TSMO Education

IowaDOT developed methods to improve their TSMO culture that included educating agency staff, regional partners, and the public. On their TSMO website, IowaDOT provides an informational video that explains TSMO and how it helps the traveling public, clips of which are shown in Figure 4.

Figure 4. Illustration. Clips from IowaDOT's TSMO Video
Source: https://iowadot.gov/tsmo/home

IowaDOT's TSMO website also provides access to the agency's TSMO Strategic Plan and TSMO Program Plan as well as links to national resources for TSMO education, best practices, and national research. This form of TSMO communication reaches a large audience through its easy accessibility.

During development of IowaDOT's TSMO program, the business case for TSMO was not well understood agencywide. To mitigate this challenge, IowaDOT is working to develop educational information for staff such as a TSMO education video that will be provided to all agency personnel. Training materials are being customized for various audiences. For example, one set of materials are tailored for field staff and another for office staff. In the future, the agency plans

to develop multi-discipline training material to help agency staff understand their role in transportation operations. As the program continues to grow, additional technical training will be developed and more support will be given to regional operations forums.

Michigan Department of Transportation (MDOT)

MDOT is responsible for Michigan's 9,669-mile State highway system. MDOT also administers other State and federal transportation programs for aviation, intercity passenger services, rail freight, local public transit services, and the Transportation Economic Development Fund.

Developing a Business Case for all Audiences

A TSMO business case identifies the benefits of implementing TSMO to mitigate common transportation challenges including congestion, funding, and safety. These cases are historically used to gain support or buy-in from regional partners, executive leadership, and the general public. MDOT has taken a unique approach to communicating their business case for TSMO to all audiences by developing five TSMO Business Cases for specific stakeholders. The five business cases have been prepared for the general public, legislators, partners, MDOT decision makers, and MDOT technical staff (see Figure 5 and Figure 6).

Figure 5. Chart. MDOT's TSMO Business Case for the General Public
Source: https://www.michigan.gov/tsmo

Figure 6. Photo. MDOT's TSMO Business Case for Legislators
Source: https://www.michigan.gov/tsmo

TSMO Implementation and Strategic Plan

Following the 2013 CMM assessment, MDOT identified the need to create a TSMO implementation plan to help mature their capabilities in each of the six CMM dimensions. The implementation plan identifies MDOT's ten core TSMO business areas. The agency administered ten outreach events, one for each business area, to identify challenges, successes, capability maturity, and action items for future growth. Development of MDOT's "TSMO Umbrella," shown in Figure 7, resulted in between 12 and 24 action items for each TSMO business area.
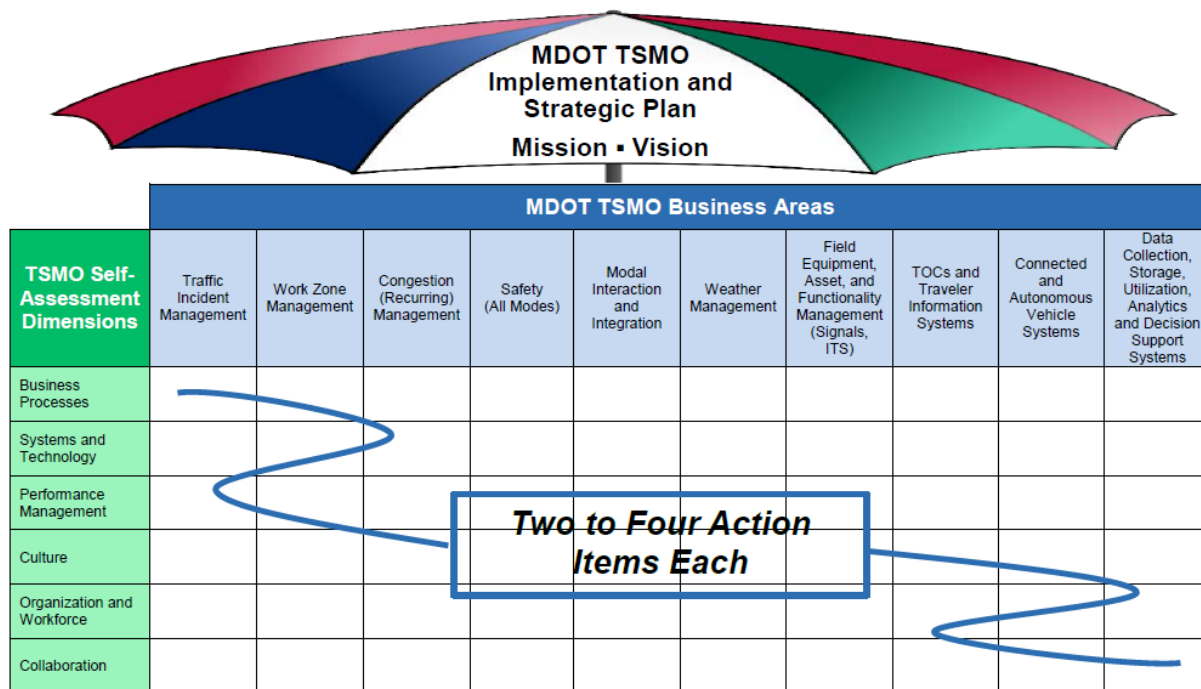
Figure 7. Chart. MDOT's TSMO Umbrella
Source: Transportation Systems Management and Operations Implementation and Strategic Plan, MDOT 2019

Action items were developed into a matrix to support capability strengthening in each TSMO business area. An example of an action item matrix to improve TSMO culture through outreach for one of MDOT's business areas is shown in Figure 8.

Modal Interaction & Integration (Example)

Priority Actions	Steps to Address Action	Supports Strategic Area of Focus							MDOT Lead	MDOT Support	Partners	Resources	Timeline	Measures of Success
		1	2	3	4	5	6	7						
Action 1: Greater Operations participation in and support of M2D2.	**Step 1**: Outreach to M2D2 organizers.		✓		✓	✓			John Doe	Jonny, Janet	M2D2 champions	Collaboration, Staff time	1 month (12/2016)	Establish point of contact
	Step 2: Agree on Ops participation		✓		✓	✓			Jane Doe	Jonathon, Janie	M2D2 champions	Partnership, staff time	2 months (1/2017)	Gain agreement
	Step 3: Select Ops representative		✓		✓	✓			Joe Doe	Jon, Jean	MDOT partners	Partnership, staff time	3 months (2/2017)	Begin participation

Figure 8. Chart. Example Action Item Matrix
Source: Transportation Systems Management and Operations Implementation and Strategic Plan, MDOT 2019

Since the first implementation plan was completed, MDOT is focusing on the culture shift needed, which revolves around financing TSMO activities. The 2019 TSMO Implementation and Strategic Plan will provide an update of matrices and action items and a history of TSMO and operations in the agency showing how funding TSMO activities can improve legacy processes.

The agency noted that workshop involvement was critical to improving the TSMO culture in the State through developing the implementation plan. Three-day workshops provided opportunities for regional partners to gain a better understanding of the benefits TSMO brings to the State and how their involvement developing the plan facilitated multi-agency and multi-discipline ownership of the TSMO program's success. A summary of the 2018 TSMO Plan Maintenance Workshop is provided in an appendix to the 2019 Implementation and Strategic Plan.

Washington State Department of Transportation (WSDOT)

WSDOT supports changing transportation needs of the State of Washington through six regional districts. WSDOT operates and maintains more than 18,600 miles of highway lanes, nearly 3,300 bridge structures, and runs a ferry system that moves 24.2 million passengers and 10 million vehicles per year.

Business Processes Result in Improved Culture

After completing the CMM assessment during SHRP2 efforts, WSDOT realized the need for other internal and external groups to be engaged with transportation operations. Identifying how to sell TSMO to the agency holistically was one of their initial challenges to improving the TSMO culture. To counter this challenge, WSDOT began advocating for TSMO through development of business processes. They prioritized business processes during their Workshop on TSMO Program Planning with items such as TSMO planning and budgeting, based on their opinion that business processes and culture directly affect each other. WSDOT plans to use their TSMO plan as the means to improve both business processes and culture. The agency performed several outreach activities, working with "grassroots" staff members to communicate the value and effectiveness of TSMO and the role it plays daily in activities throughout the agency. WSDOT feels this outreach made the highest impact on improving the agency's TSMO culture.

TSMO Educational Website

Additionally, WSDOT developed a TSMO website to promote the value of TSMO for use by internal staff and regional partners. The website provides TSMO education, the "when-why-how" to use TSMO, and how to deploy TSMO strategies. Figure 9 shows highlights from the website of various transportation strategies and concepts and provides links to educational explanations of solutions that can mitigate these challenges.
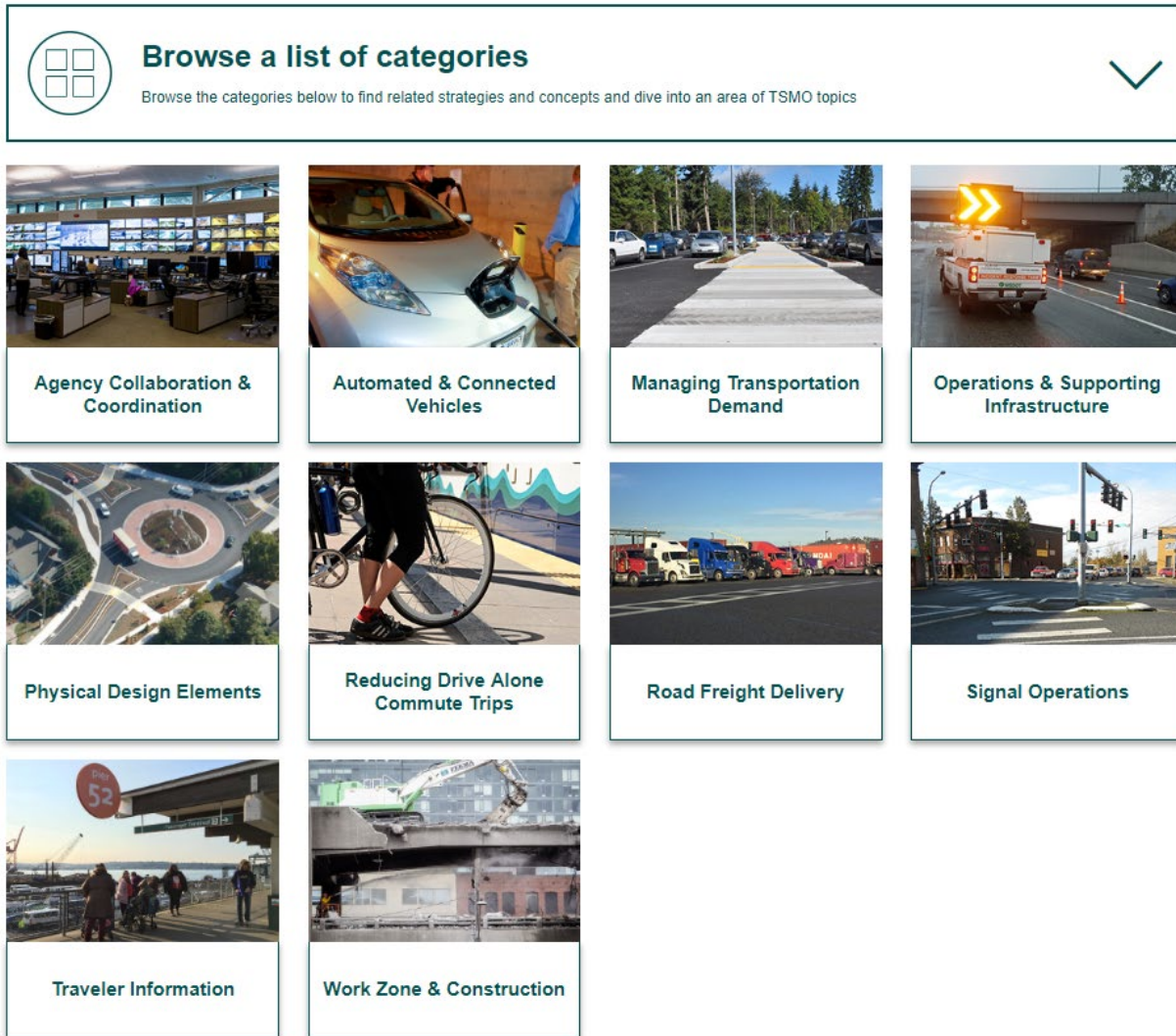
Figure 9. Illustration. WSDOT TSMO Website – Transportation Strategies and Concepts
Source: https://tsmowa.org

The WSDOT TSMO website has helped to improve the TSMO culture for the region by providing readily accessible information and transparency regarding regional transportation challenges as well as the goals and objectives of WSDOT's TSMO program. The agency has had great success with the website and additional funding has been allocated to release an updated version in the summer of 2019. A link to this educational website is provided in the references section of this report.

WSDOT also noted that having a TSMO champion to support TSMO outreach activities has helped to enhance their TSMO culture. This champion continually advocates for TSMO in the agency and facilitates discussion for future improvement.

CHAPTER 3 – SUMMARY

Improving an agency's or region's transportation systems management and operations (TSMO) culture usually occurs simultaneously with improvement of other TSMO dimensions. As an agency advances business processes and collaboration, the TSMO culture also matures. Traditional methods for improving culture, such as outreach or training specific to TSMO, can also be used. Each agency interviewed used varying methods to advance the TSMO culture in their organization or region. Some of the best practices identified in this case study include:

- Using a multi-discipline and multi-agency approach to integrate TSMO into existing planning and project development processes promotes agency culture by highlighting and reinforcing agency TSMO goals and objectives.
- Educational TSMO websites provide information to all stakeholders in an easy to access and easy to understand format. Educational websites promote TSMO culture in agencies by providing access to State TSMO plans, national resources, and general information. They effectively communicate the "when-why-how" of TSMO.
- The business case for TSMO does not always resonate with multi-discipline staff or varying regional stakeholders. Defining a TSMO language for individual stakeholders promotes TSMO culture by communicating the value and effect of TSMO to each stakeholder using challenges and solutions familiar to them.

A TSMO-focused culture is the backbone for success in all other TSMO components. As the culture advances and improves, so does the progress of other TSMO components. Several methods can be used to improve the TSMO culture within an agency. Organizations should assess their current TSMO culture and identify opportunities for improvement using existing or enhanced processes, organizational structures, and programs. The best practices identified in this case study can inform agency administration and leadership of opportunities to improve and support a TSMO culture within their organization.

REFERENCES

Information for use in this case study was gathered from sources noted throughout the report together with the following websites:

- FHWA's What is Transportation Systems Management and Operations (TSMO)?
  - https://ops.fhwa.dot.gov/tsmo/index.htm
- AASHTO's TSMO Guidance
  - http://www.aashtotsmoguidance.org/
- FHWA's Organizing and Planning for Operations
  - https://ops.fhwa.dot.gov/plan4ops/
- FHWA's Organizing for Operations Resources
  - https://ops.fhwa.dot.gov/plan4ops/focus_areas/organizing_for_op.htm
- FHWA's Organizing for Reliability – Capability Maturity Model Assessment and Implementation Plans
  - https://ops.fhwa.dot.gov/docs/cmmexesum/sec1.htm
- FHWA's Creating an Effective Program to Advance Transportation Systems Management and Operations, Primer
  - https://ops.fhwa.dot.gov/publications/fhwahop12003/index.htm
- FHWA's Improving Transportation Systems Management and Operations – Capability Maturity Model Workshop White Paper – Culture
  - https://ops.fhwa.dot.gov/docs/cmmwhitepapers/culture/index.htm
- Additional SHRP2 Resources
  - https://www.fhwa.dot.gov/goshrp2/
- Colorado Department of Transportation
  - https://www.codot.gov/
- Florida Department of Transportation
  - http://www.fdot.gov/
- Iowa Department of Transportation
  - https://www.iowadot.gov/#/services
- Michigan Department of Transportation
  - https://www.michigan.gov/tsmo
- Washington State Department of Transportation
  - http://www.wsdot.wa.gov/
- Washington State Department of Transportation's TSMO Education
  - http://fratis.trac.washington.edu/TSMO/

Table 1. Interview Participants and Agencies

Agency	Michigan Department of Transportation (MDOT)	Colorado Department of Transportation (CDOT)	Florida Department of Transportation District 4 (FDOT D4)	Iowa Department of Transportation (IowaDOT)	Washington State Department of Transportation (WSDOT)
Agency Representative Name:	Steve Cook	Ryan Rice	Melissa Ackert	Scott Marler	Monica Harwood
Agency Representative Title:	Engineer of Operations and Maintenance	Former Director of TSMO	FDOT D4 TSMO Program Engineer	Director of Operations Bureau	Workforce Development and Traffic Operations Engineer
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Interview Date:	July 5, 2018	July 9, 2018	July 13, 2018	July 20, 2018	August 13, 2018