



U.S. Department of Transportation
Federal Highway Administration

Advancing Organizational Capabilities for Transportation Systems Management and Operations

February 2018 Peer Exchange Report



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16. Abstract This report summarizes the findings of a peer exchange that brought together transportation agencies to discuss challenges, best practices, and lessons learned related to advancing organizational capabilities for transportation systems management and operations (TSMO). The peer exchange was held in Arlington, Virginia on February 7 and 8, 2018. Participants from twelve (12) State departments of transportation (DOTs), two (2) metropolitan planning organizations (MPOs), one (1) county-level DOT, and one (1) regional operations organization discussed the six dimensions of the TSMO Capability Maturity Model, and efforts being undertaken within each of their agencies. Discussions addressed topics including making the business case for TSMO, changing agency culture, integrating TSMO into business processes, staffing and workforce development, financial planning, and performance management, as well as implementation strategies.					
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Executive Summary

The Federal Highway Administration (FHWA) Office of Operations hosted a peer exchange on the topic of “Organizing for Reliability” in Arlington, Virginia on February 7-8, 2018. The two-day peer exchange built upon earlier efforts conducted under the second Strategic Highway Research Program (SHRP2) Reliability focus area, which developed a Transportation Systems Management and Operations (TSMO) Capability Maturity Model (CMM) and provided workshops and financial and technical support for CMM implementation activities. Research done for SHRP2 found that agencies with the most effective TSMO activities were not differentiated by budgets or technical skills alone but by the existence of critical processes and institutional arrangements focused on TSMO. This finding led to the development of the CMM. A sampling of agencies that implemented the CMM were invited to participate in this peer exchange.

The purpose of the peer exchange was to enable agencies to: 1) learn from each other about the challenges, opportunities, and effective practices that transportation agencies have employed to improve their capabilities related to institutionalizing TSMO; and 2) brainstorm future needs for continuing to advance organizational capabilities for TSMO. The peer exchange agenda (see Appendix A) focused on topics identified by participants prior to the workshop as most beneficial for discussion, building on the six dimensions of the TSMO CMM:

- Business processes,
- Systems and technology,
- Performance measurement,
- Culture,
- Organization and workforce, and
- Collaboration.

Representatives from seventeen (17) organizations participated in the peer exchange, including: from twelve (12) State departments of transportation (DOTs), two (2) metropolitan planning organizations (MPOs), one (1) county-level department of transportation, and one (1) regional operations organization. In addition, representatives from the American Association of State Highway and Transportation Officials (AASHTO), FHWA, and facilitators and note-taking support from ICF were in attendance (see Appendix B for a list of participants).

Key Takeaways

Although participating agencies differed in context, geography, and organizational structures, several themes emerged from the discussions:

Defining TSMO – TSMO includes many different strategies and components.

While the term TSMO is defined in Federal legislation, as participants shared experiences, they recognized that the term TSMO is applied differently across their organizations. TSMO encompasses overall approaches to moving people and goods as well as many different strategies, such as incident management, work zone management, and freeway management, and there is a need to clearly communicate the meaning of the concept. Some agencies, for instance, include demand management and transportation planning activities that support reliability within the context of TSMO, while others do not. The question of “What is TSMO?” was significant enough to be chosen by the participants of the peer exchange as a breakout group topic. The consensus definition from this breakout was “Practice of managing traffic, technology, systems, and people to reduce congestion and emissions, and improve reliability and safety.” The participants recognized that regardless of what terminology is used and what strategies are being deployed, it is important to be able to clearly convey the concept of TSMO within the organization and to stakeholders.

Telling the TSMO Story – Agencies need to be able to communicate the value of TSMO to varying audiences, including in rural areas, in order to foster a reliability focus and culture.

Changing agency culture continues to be a challenge for many agencies, and the topic of greatest interest to participants at the outset was “making the business case” for TSMO. This interest led to the question of “how do we tell the TSMO story?”, both within the agency and to external partners. Participants created a list of “soundbites or hashtags” to quickly express the key messages, highlighting concepts such as efficiency (“squeezing more capacity out of existing infrastructure”, “do a lot for a little”), getting to destinations on-time (“trips you can count on”, “know before you go”, “door to door”), and economic benefits. Communicating the value of TSMO is important for leadership buy-in, as well as for stakeholders. Given the focus on traffic congestion in most discussions of TSMO, participants felt there is a particular need for agencies to find effective methods of making the case for TSMO in rural areas. Some applications of TSMO, such as road weather management, special events management, and freight management strategies, can provide important benefits in rural areas by improving safety and helping to support tourism and the economy. Identifying gaps in awareness through communication with rural partners can help agencies better implement TSMO in rural areas.

Mainstreaming TSMO – There is a critical need to mainstream TSMO throughout transportation decision making and to imbed TSMO into a full array of agency functions.

TSMO can be integrated into an organization in many different ways: planning, project development, programs, performance measurement, and funding. When participants were asked to highlight a key theme that emerged after Day 1 of the workshop, the word “mainstream” rose to the top, as shown in the word cloud on the following page (Figure 1). Participants reported on efforts to integrate TSMO into planning and project development and identified a range of effective practices. For instance, Florida DOT’s District 4 held a Value Engineering workshop,

which identified how TSMO could be integrated into projects and resulted in development of a Scoping Form to be used in project development. Although some agencies, such as Arizona DOT, have found success in elevating the role of TSMO through creation of a TSMO Division, others such as Maryland and Washington State have worked to integrate TSMO into agency practices without an agency reorganization.



Figure 1. Word cloud showing participants' responses to the question "What was a key theme or take away?"

Partnerships – Working together yields benefits.

Beyond integrating TSMO into their own agencies, partnerships among agencies are important for a successful and sustainable TSMO program. Successful examples of State DOTs and MPOs working together, regional operations organizations that bring together multiple stakeholders, and engagement of different partner organizations (e.g., law enforcement) were highlighted throughout the workshop. AZTech and the Niagara International Transportation Technology Coalition (NITTEC) demonstrated the power of partnerships in advancing TSMO on a regional scale. These agencies are fostering communication and collaboration in their regions between agencies that normally may not interact. The increased collaboration raises general knowledge of projects and resources within the region.

Funding – There are a variety of funding sources being used for TSMO.

Agencies use a broad range of funding sources for TSMO activities, including funds generated from advertisements, regional taxes, State Planning and Research (SPR) funds, safety funds, Congestion Mitigation and Air Quality (CMAQ) funds, and Federal grants, among others. In some cases, TSMO activities are also funded as part of construction projects. One example of a dedicated funding source is in Nevada, where it was legislatively mandated that funds from blue interstate signs be used for traveler information services, providing an on-going source of revenue to that program. Although a couple of agencies mentioned having some dedicated funding for TSMO, most agencies do not have dedicated funding for TSMO but compete for funding with other needs.

Participants pointed to the challenge associated with competing priorities within agencies, especially with regard to funding TSMO projects and services. However, the participants noted that obtaining funding is easier when TSMO is identified as an agency-wide priority. Still, the lack of maintenance funding for ITS equipment is a common challenge faced by agencies, and participants noted the need to take a life-cycle approach to TSMO infrastructure.

A key recommendation for agencies emerged over the course of the peer exchange: develop policies and procedures for identifying lower cost TSMO projects that address transportation needs and then finding the appropriate funding mechanism, rather than allowing the funding mechanism to dictate the type of projects pursued.

Changing Agency Culture – It takes time, persistence, and patience.

The full integration of TSMO requires changing agency culture, which is not a simple or quick process. Although executive leadership or a high-profile incident often has been an impetus, in some cases, bottom-up approaches have been driving TSMO within agencies. Participants identified motivation, partnership, and coordination as necessary for success. Participants noted that it is essential that “TSMO thinking” and a focus on improving system reliability permeate the organization, and successes help to demonstrate the power of TSMO solutions.

The Value of Peer Exchange – Sharing ideas and practices is valuable.

Although not a direct point of discussion in the workshop, the peer exchange itself highlighted the value of bringing diverse agencies together to discuss common challenges and successes, and to learn from each other. Participants highlighted the value of hearing about practices from other agencies and noted that they came away with new ideas.



Source: ICF

Figure 2. Participants engaged in large group discussions during the peer exchange

What’s Next? A desire to keep the momentum going.

Participants repeatedly asserted the value of the second Strategic Highway Research Program (SHRP2) and the desire to continue the momentum for TSMO. In thinking about what’s next, the general opinion was “*We’ve accomplished a lot, but there is still a lot to do.*” With the SHRP2 Program coming to its end, participants are looking for new opportunities to keep the focus on TSMO, and are seeking opportunities to continue to advance TSMO innovations.

Peer Exchange Sessions

Capability Maturity Model Results Overview

Joe Gregory of FHWA welcomed participants and framed the context for the peer exchange on “Organizing for Reliability,” as focusing on how to advance organizational capabilities for transportation systems management and operations (TSMO). He noted that reassessments under the TSMO capability maturity model (CMM) from the past year showed increased overall scores across the six dimensions of the CMM. The overall trend for the CCM assessment scores was upward and TSMO activities have increased across the board.

Agencies have seen significant progress on many of the TSMO activities they included in their action plans from the CMM workshops. There are some individual agencies that saw their scores increase marginally or decrease slightly. These lower scores were attributed to increased agency awareness and understanding of TSMO and better recognition of their own levels of maturity during the reassessment. As a result, the re-evaluated scores are considered a more accurate score for the agency than was obtained during the original assessment. For the overall effort, he noted that high-level trends are emerging:

- Agencies are having more success in gaining buy-in for TSMO-related activities and efforts, especially from senior leadership and key stakeholders,
- Some State DOTs are reorganizing to make TSMO a higher priority and some are creating new positions within the agency to lead and coordinate TSMO efforts, and
- Agencies are using a combination of strategic, programmatic, and tactical planning for TSMO that has resulted in more comprehensive plans for TSMO.

Participant Agency TSMO Highlights

Participants were asked to create an introductory presentation to share agency actions, successes, and challenges with regard to TSMO. These presentations were shared toward the beginning of Days 1 and 2. A summary of each participant presentation can be found in Table 1.

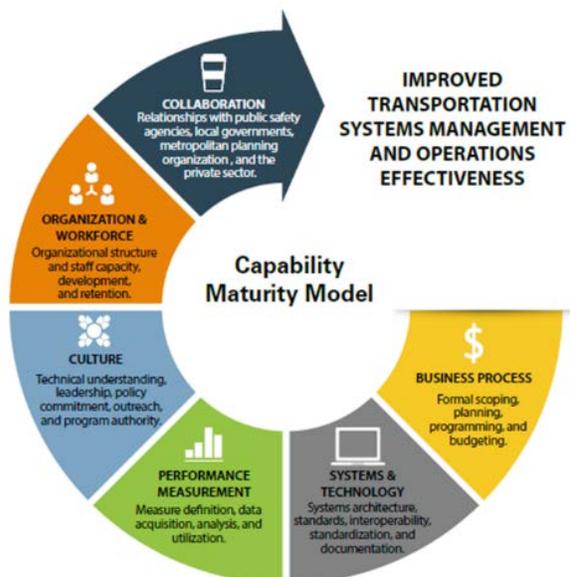


Figure 3. Six dimensions of the TSMO CMM



Source: ICF

Figure 4. Peer exchange participants shared individual stories of successes and challenges

Table 1. Round Robin Introduction Presentation Summaries

Participant	Agency	Summary
Melissa Ackert	Florida DOT District 4	Florida DOT’s District 4 conducted a Value Engineering Workshop, which multiple agency offices attended to discuss successful TSMO efforts, unsuccessful TSMO efforts, and ways to further TSMO efforts. The result of this workshop was 42 specific recommendations for implementing TSMO in Florida DOT’s District 4. Notably, this included a project scoping form which has helped identify projects where TSMO can be “tagged on,” or added to the original scope of a project. Current challenges faced by FDOT are finding methods to fund projects through traditional planning processes.
Brent Cain	Arizona DOT	Arizona DOT has taken a top-down approach to TSMO, with the DOT director creating a division within the agency focused on TSMO. Of the roughly 3,700 DOT employees, around 300 are within this TSMO division. Current challenges faced by Arizona DOT include: increasing awareness and understanding of TSMO across the department, and establishing business processes to incorporate operations.
Solomon Caviness	North Jersey Transportation Planning Authority (NJTPA)	NJTPA is an MPO which helps to support New Jersey’s TSMO programming efforts by planning for workshops on TSMO topics, such as Smart Cities, Connected and Autonomous Vehicles, and others. Since supporting NJ DOT’s CMM assessment in 2014 and reassessment in 2017, NJTPA has used the results to create <i>The Connected Corridor</i> , New Jersey’s ITS Architecture maintenance and multi-agency collaborative framework for ITS & TSMO program planning. Current challenges faced by the NJTPA are getting buy-in and commitment from New Jersey agencies for TSMO.
Nick Compin	Caltrans	Caltrans is currently developing a “TSMO Umbrella” as a visual tool (see Figure 10), illustrating how institutional, technical, and operational integration efforts are all TSMO efforts. Current challenges faced by Caltrans include: agency culture where more experienced staff are “stuck on the old way” of operations management, and existing processes which limit funding for TSMO activities.
Hugh Conroy	Whatcom Council of Governments	Whatcom Council of Governments in Washington State is the lead agency for the region’s U.S.-Canada cross-border planning coalition, called the <i>International Mobility & Trade Corridor Program</i> (IMTC). Since their CMM, Whatcom COG has included IMTC activities in its MPO Work Program, made steps towards adopting a greater emphasis on performance measurement related to binational border operations and goals, and has increased public use of radio frequency travel documents for efficient border inspections. A current challenge faced by Whatcom is finding available funding to maintain and validate operations data sources.
Monica Harwood	Washington DOT	Washington DOT was one of the State DOTs which scored lower on its CMM re-assessment than it did on the original assessment; however staff have attributed this to “knowing a lot more about what they didn’t know before.” WSDOT is in good public standing for its day-to-day operations and has a strong organizational commitment to TSMO,

		which has increased opportunities for other partnerships with public agencies. The challenges faced by the agency include a culture that favors roadway expansion, a lack of an overall common goal, and using performance reporting data to support decisions.
Tom Hein	Kansas DOT	Kansas DOT found that a recent budget cut has actually helped increase TSMO efforts, since the agency is attempting to increase effective capacity in the Wichita metropolitan area without funding new major projects. The recent CMMs for Wichita and statewide work zones were successful in getting transportation planners and designers in the same rooms and having conversations that would not ordinarily have been had. TSMO efforts at Kansas DOT have mostly been a bottom-up effort, and a significant challenge identified was how to gain buy in from agency executives.
Athena Hutchins	Niagara International Transportation Technology Coalition (NITTEC)	NITTEC is a binational, multi-agency transportation operations coalition in the Buffalo, NY region with 5 policy members, 9 general members, and 29 affiliate members. Recently, NITTEC conducted an Integrated Corridor Management joint study to inform how joint projects are successfully conducted, as well as developed a Regional Traffic Signal Operations Plan to increase signal optimization in a region where there are many traffic signal owners. Challenges include a struggle to engage higher levels of management and a need to increase understanding of what TSMO is at the State level.
Denise Inda	Nevada DOT	Nevada DOT recently held a TSMO Program Planning Workshop, which included a peer-to-peer exchange that informed Nevada DOT's business case. Following the workshop, NVDOT has been working on its business case and shifted the TSMO focus to enabling tourism in the State. The agency is facing a challenge in keeping internal stakeholders involved and moving efforts within the agency from champion-based to a more programmatic focus.
Tyler Laing	Utah DOT	The agency is currently focused on Connected/Autonomous Vehicle efforts, developing a TSMO business case, and expanding its fiber optics network to help enhance its traffic signal program. Additionally, Utah DOT is currently looking to expand variable speed limit corridors and standardize ATMS and ITS. The agency's main challenge is communicating TSMO within the department so that everyone understands it and knows how it fits within their role.
Subrat Mahapatra	Maryland DOT	Implementation of TSMO in Maryland DOT has two major tracks – Planning and Operations. Maryland DOT has successfully undertaken organizational modernization efforts, which has created buy-in for TSMO from executive leadership and mid-level management. Recently, the agency has been able to take advantage of the focus on Connected and Autonomous Vehicles in their efforts to implement TSMO. The challenges the agency are facing include integrating freeways and arterials, and taking their organization's TSMO goals to a broader set of external partners.

Meredith McDiarmid	North Carolina DOT	Key efforts at North Carolina DOT include aligning planning and operations functions, increasing TSMO staffing levels, and keeping TSMO aligned between regional and field offices via increased communication efforts. TSMO staffing levels on both the DOT and contractor side have increased, and recently the ITS Planning and Design division was merged with the Traffic Operations division under a single manager which has helped (enter what). A significant challenge at North Carolina DOT is that TSMO projects are not yet part of the TIP Project Prioritization process.
Jason Oldham	Tennessee DOT	There is a large focus at Tennessee DOT on incident management and trying to increase buy-in for TSMO related efforts. Tennessee DOT has successfully standardized TMC operations across the State, created a TSMO Program Plan, and incorporated TSMO into the long range planning process. Current challenges include the increased growth and congestion rates in urban areas, and the lack of funding for TSMO data, staff training, and technology infrastructure.
Kelli Raboy	District DOT	In Washington, D.C.'s 61 square miles, there are only 15 miles of freeways, with limited potential for expansion or new infrastructure, thus necessitating a focus on increasing effective capacity from existing assets. The District DOT (DDOT) is currently focused on building its staff that deal with TSMO and cultivating champions across the agency. DDOT has succeeded in updating its asset inventory with GIS and other agency-wide tools, and has been taking steps to create a formal TSMO strategy. Current challenges include getting on-the-ground staff on the same page as in-the-office staff regarding the agency's TSMO efforts.
Faisal Saleem	Maricopa County DOT	The AZTech partnership is a regional traffic management partnership in the Phoenix metropolitan area, including Arizona DOT, Maricopa County, the Maricopa Association of Governments, local governments, and other partners. One of AZTech's current initiatives is to provide partner agencies with standardized job descriptions so specialized staff can be recruited for TSMO functions. Current challenges include: shifting from a local to a regional focus and getting executive level decision makers (specifically within smaller jurisdictions) to fully embrace TSMO. Currently, AZTech Performance Indicator Books are developed to promote TSMO to the operational decision makers.
Willy Sorenson	Iowa DOT	Iowa DOT is focused on shifting its agency culture to be more conducive to TSMO. Every month, a list of accomplishments related to TSMO is released to DOT employees, which helps keep TSMO at the forefront of employees' attention. Currently, Iowa DOT is shifting the responsibilities of the State TIM Committee to a non-profit and is working on developing a TIM Training Center. A current challenge faced by the agency includes limited ability to devote staff time towards increasing TSMO awareness.
Patrick Zelinski	AASHTO	AASHTO has developed the Committee on Transportation System Operations to help its partner agencies focus on operations, wireless communications, and highway transport. The goal of this committee is to help transform the national transportation community to a TSMO culture.

Communicating the Value of TSMO / Making the Business Case

During this session, participants were engaged in an exercise to think about communicating the value of TSMO. Participants were challenged to quickly identify a soundbite or hashtag that described why TSMO is an important effort to be pursued by the agency, resulting in a wide array of ideas (see text box). Some of the responses generated significant discussion. For example, “Zero delay” was suggested as similar to the “Zero fatality” goal from the Safety area. This received some rebuttal from other participants, who suggested “100% Reliability” might be a better alternative for the idea expressed. Another borrowed phrase was “you can’t build your way out of” the problem – typically applied to congestion.

One analogy that came from the soundbite activity was the comparison of TSMO to mold. Two initial points framed the mold analogy. First, much like mold, the concept of TSMO involves a lot of different things that are hard to explain; however, everyone can recognize it when they see it.

Second, as with penicillin that is created from mold, there will be creative applications for TSMO that are not currently being used today and will provide great value in the future. Participants felt it is the job of TSMO professionals to look for the opportunities and encourage the growth of a TSMO culture; just as a researcher would encourage the growth of a mold culture. This analogy was developed and referenced throughout the peer exchange.

Iowa DOT Peer Presentation

Willy Sorenson of Iowa DOT gave a presentation on how Iowa DOT has made the business case for TSMO. Within Iowa, an average of 3,000 crashes occur every month, contributing to 400 fatalities a year. Recently, a snowstorm caused a 70 car pile-up, which resulted in one fatality. The dramatic video footage of cars crashing as a result of this storm makes a clear case for the importance of road weather management and incident management. Moreover, the economic cost of delay from these crashes as well as the value of individual life clearly demonstrate the critical role of managing the transportation system. Additionally, \$400 billion dollars’ worth of goods move through Iowa every year – delaying these goods results in increased costs to

Communicating the Value of TSMO

Participant ideas for a quick communication message included:

- Get more out of what you already have
- Efficiency: Squeezing more capacity out of existing infrastructure
- Reliability
- Economical: Cheaper than adding a lane, good return on investment, do a lot for a little
- You can’t build your way out
- Faster: Quicker to implement
- Faster travel, less delay, on-time travel, zero unexpected delay (or 100% reliable)
- Guaranteed on time
- Embracing technology
- Capacity is an asset
- Plan ahead: Know before you go, the travel source
- The door to door travel experience
- Mobility as a service

consumers and in shipping goods to markets around the world. Therefore, Iowa DOT has successfully made the business case that reliable roads contribute to healthy economic development, including jobs growth.

The Iowa DOT's TSMO Process was developed in three stages: strategic, programmatic, and tactical. The first stage began with the DOT Director and Division-level Leadership coming together to create a 10-page, high-level document

which outlined a strategic direction for the entire DOT to take regarding TSMO. The second, programmatic stage, was comprised of middle management who created a 100-page plan targeted towards agency leadership. The final stage is the development of a series of service layer plans addressing specific services, such as traffic management centers, traffic incident management, and traveler information. This top-down approach, starting with executive leadership and progressing to specific details, has helped to leverage existing planning processes and further a TSMO culture at the agency.

Discussion

Following the Iowa DOT presentation, the discussion of communicating TSMO continued. Participants were asked to identify audiences for the business case message. For example, who did they want to convince? What groups may benefit from the message? Answers included:

- Political/Government administrations
- Internal partners within a State DOT, like divisions or districts, including front-line supervisors, resident engineers, and maintenances crews
- Metropolitan Planning Organizations
- External agency partners, such as State and local peers
- State legislatures and elected officials
- Law enforcement and emergency management partners
- Road builders
- Business communities such as Chambers of Commerce

At the end of this activity, the participants were asked to consider the relationship between the “soundbites” or messages and the audiences for the “value of TSMO” business case. Participants

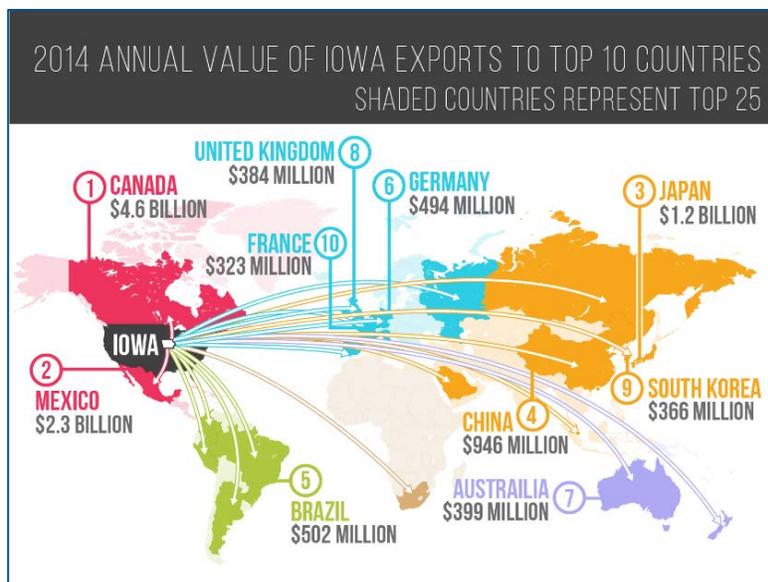


Figure 5. Iowa DOT makes the connection between system reliability and economic activity, highlighting the importance to export markets

noted that it is important to match the message with the right audience based on unique interests and responsibilities.

Changing Agency Culture

The group discussion on Making the Business Case transitioned into a discussion on agency culture, and methods to foster a favorable agency culture for TSMO. Participants agreed that a TSMO culture means there is a focus on TSMO across the organization. In other words, TSMO is not something that can be neglected because it is “somebody else’s job,” because TSMO is a part of everyone’s job.

TSMO is not “somebody else’s job,” because TSMO is a part of everyone’s job.

Participants found value in having executive support for TSMO activities and integration. Top-down support ensures the prevalence of an across-the-board focus, which is necessary for a successful TSMO culture. Several States, including Florida, Tennessee, Arizona, and Iowa, noted that their TSMO efforts stemmed from agency leadership. For instance, Arizona DOT chose to institutionalize TSMO by reorganizing its divisions to better embrace TSMO without adding any additional staff. This effort has gone a long way in developing a culture for operations by creating a greater focus within the organization on the value and importance of TSMO.

Other States, such as Nevada, North Carolina, and Kansas, noted significant initiatives from the staff level and more of a “bottom up” approach, and many other participants indicated that their agencies fell somewhere in the middle. Some agencies expressed concern that institutionalizing TSMO into an individual division or position would cause other divisions and employees to not fully integrate TSMO in their daily responsibilities since it would be viewed as a different part of the organization. For instance, Maryland DOT decided to bring TSMO efforts into existing parts of the organization rather than create a new branch or division. This method was viewed to be successful by the Maryland DOT participants. In both cases of Arizona and Maryland, executive leadership helped the agency towards establishing a TSMO culture.

Agencies that had seen top-down integration of TSMO usually were often able to trace the beginning of TSMO integration to a single incident

What enables TSMO?

Peer exchange participants identified a broad range of TSMO enablers.

- A top-down approach creating a TSMO-focused division within the agency (Arizona)
- Budget cuts limiting funding for new major projects while needing to increase capacity in an urban area. (Kansas).
- Developing a project scoping form and requiring its use (Florida)
- Safety – the economic cost of delay plus the value of individual lives (Iowa)
- Focus at the Secretary’s level on the customer experience and outcomes (Maryland)
- Creating a new Traffic Incident Management training facility, to address real world experiences under real world conditions (Tennessee)

highlighting the need for TSMO. In Iowa, a snowstorm during Black Friday (day after Thanksgiving) in 2012 caused significant lane closures. In Florida, a major bridge between Palm Beach and West Palm Beach was closed, creating major issues on arterials in the region. The coordination between agencies and partners that resulted from that closure evolved into what is the current Florida DOT arterial management program. In both cases, a “common enemy” united efforts within agencies and across partners. These united efforts developed into a focused TSMO culture.

Business Processes: Integrating TSMO into Planning and Project Development

Participants from Maryland DOT, Florida DOT, and Washington State DOT all presented on how their agencies have built business processes around TSMO. The presentations highlighted that no two agencies are alike when it comes to integrating TSMO into planning and project development.

Maryland DOT Peer Presentation

Joey Sagal and Subrat Mahapatra of Maryland DOT gave a presentation on how Maryland has begun to integrate TSMO into planning and project development. The current transportation system is operating at or over capacity in the Baltimore and Washington, DC regions. At the same time, consumer needs are changing as new technologies enter the transportation marketplace. Maryland DOT had strong TSMO foundations with dynamic message signs and a good signal system. From this basis, Maryland DOT created its TSMO Strategic Plan, which included four goals:

1. Develop and implement a sustainable TSMO program.
2. Improve travel time reliability for both people and freight by looking into smart signal corridors, telecommunications, and other advanced systems and technologies.
3. Identify and analyze common data sets and performance measures within multiple systems.
4. Determine outcomes by looking at bottom line change (how has the user’s experience changed?).

Out of this plan emerged two tracks: the operations track, which is consumer-focused and seeks to take advantage of emerging technologies; and the planning/performance track, by which Maryland DOT developed a list of projects and corridors where TSMO could be implemented. By comparing this list of intended TSMO projects to a map of planned projects, conversations occurred between parties that would not ordinarily communicate, and the TSMO projects began moving forward.

The focus on the customer experience and outcomes driven at the Secretary’s level has been a shift that has aided TSMO efforts. By

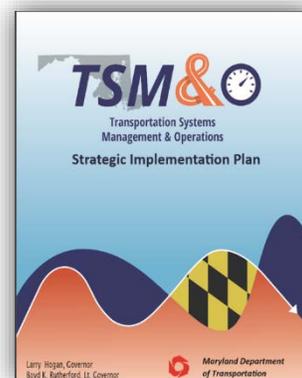


Figure 6. Maryland DOT’s TSMO Strategic Implementation Plan

asking questions such as “how much will users save under these identified strategies?” and “what is the cost to the consumer?”, Maryland has been able to encourage a TSMO focused culture, which has helped to integrate TSMO into planning and project development.

Florida DOT District 4 Peer Presentation

Melissa Ackert of Florida DOT’s District 4 gave a presentation on integrating TSMO into planning and project development from a district perspective. District 4 conducted a Value Engineering Workshop in which engineers met with planners, designers, and construction and maintenance staff to talk about “how projects are born, and how TSMO can be incorporated into that process.” The result of this workshop was more than 40 recommendations for changing agency culture and processes to incorporate TSMO, including development of a District 4 TSMO Master Plan.

One of the significant recommendations highlighted was the development of a Florida DOT Scoping Form, and a requirement to make this form necessary for any project looking to move forward. At the beginning of a project, the project manager must fill out the form about TSMO and meet with someone in the TSMO office, who will provide feedback on how to incorporate TSMO ideas from the Master Plan. This ensures that Florida DOT does not miss opportunities to integrate TSMO into projects under development.

A complexity in the nature of MPOs in Florida opened an opportunity for TSMO integration. While most MPOs are regional in nature, Florida MPOs are county based and work collectively for regional planning. A TSMO subcommittee was developed at this regional level, which incorporated employees across multiple MPOs. This subcommittee is able to review successful TSMO projects (and reasons why TSMO was not incorporated into other projects) to determine potential funding sources and best practices for future projects. Paths to success identified included: safety funding being available, looking at capital funding available, Memoranda of Agreement (MOA) between Florida DOT and the local agency for maintenance of devices, inter-county agreements (for projects at county boundaries), and desirable benefit-cost ratios. As MPOs are updating their long-range transportation plans, a focus is now on integrating TSMO into those plans.

TSM&O Unit Checklists

The following questions will help the TSM&O section of Traffic Operations and the project manager determine which TSM&O issues, deliverables and milestones are to be included in the project. It will also determine the potential impact of the project to existing TSM&O related infrastructure (e.g. communications) and flag those projects that need additional project requirements in order to protect and/or upgrade TSM&O infrastructure.

Preservation of TSM&O Infrastructure

Based on the questions answered below, additional contract language may need to be incorporated.

Confirmation			
Please confirm the following questions.			
	Yes	No	Comments
Please visit the District's GIS website and determine if the project limits have existing ITS or ATMS devices within the limits. Does the project contain existing ITS/ATMS?	<input type="checkbox"/>	<input type="checkbox"/>	
Does the project plan to install ITS or ATMS devices? If yes, please indicate in the comments section how spare parts/components/devices and spare fiber/conduit will be considered in the project budget.	<input type="checkbox"/>	<input type="checkbox"/>	
Is the project on an interstate facility? If yes, please discuss with the District Four Incident Management Program Manager how the project will incorporate incident management requirements. Please summarize how incident management will be incorporated in the project in the comments section.	<input type="checkbox"/>	<input type="checkbox"/>	
Recommendations from Traffic Operations:			

Figure 7. Portion of TSMO Checklist from the FDOT Scoping Form

Washington State DOT Peer Presentation

Monica Harwood of Washington State DOT gave the final presentation on integrating TSMO into planning and project development. The agency did not reorganize for TSMO, but had reorganized 20 years earlier to better integrate traffic operations into the department. When considering how best to integrate TSMO into agency culture and processes, Washington State DOT found that its current organizational chart was conducive to promoting TSMO, and decided to make no changes to it but to focus on processes.

Washington State DOT created a program called the Corridor Sketch Initiative, which seeks to incorporate practical solutions on the planning side as well as practical solutions with operations applications. The agency wanted a systems approach, and looked to integrate modes, governments, and agencies along individual corridors in an attempt to be proactive in planning for user needs instead of reactive. This meant projects need to be flexible and performance-based. In other words, in order for projects to produce performance-based results they need to be planned in a performance-targeted manner, and those targets need to be able to change as user needs change.

Every State highway in Washington is currently covered in a corridor sketch. Within the 304 identified corridors, Washington State DOT engaged partners and helped create high level strategies based on what has been working well in the corridor, what needs to be improved in the corridor, and what strategies could be used to both close the gap on those identified improvements and preserve the efforts of what is working well. When engaging these partners, TSMO was broken out into four categories (which are now the agency's definition of TSMO): Corridor Management, Demand Management, Minor Operational Improvements, and Planning.

Coming out of these corridor sketches, Washington State DOT and partner agencies have a set of strategies, not a list of specific projects. The idea within the agency is that in doing planning, staff are now searching for the best projects; agencies should find the correct project and match up funding later, rather than the typical practice which was “we have this bucket of money so we can pursue these types of projects.”

Emerging Transportation Technologies and TSMO

During this session, participants discussed the implications of TSMO in the future of Big Data, machine learning, and connected and automated vehicles (CV/AVs). These are important topics in long-range transportation planning, and participants were asked how these advanced technologies are being considered in the context of TSMO. Current involvement of agencies related to CV/AVs and advanced technologies was also discussed, and most participants noted that their States or regions are involved in activities (pilots, planning, etc.), and in most cases, TSMO staff play an important role.

Participants agreed that there is a lot of uncertainty about what technologies will emerge and what type of infrastructure they will need. For example, it is currently too early to tell which communications platform will emerge as the dominant one. No one within the transportation agencies wants to install costly infrastructure that ultimately will not be used; however, there is a need to start installing infrastructure now so that it exists when CV/AVs substantially enter the transportation fleet. The interest in emerging technologies among elected officials and the public offers an opportunity for agencies to better sell TSMO to decision makers. Multiple participants cited SmartCities and CV/AVs as strategies to further TSMO.

Staffing and Workforce Development

Many agencies are facing staffing and workforce development issues in relation to TSMO. Two major themes arose during the discussion: training and staff turnover. Many agencies have seen a shift from classroom-formatted trainings to online trainings. This sometimes limits the ability for different learners to get all the information they need in order to properly do their job.

Additionally, agencies are seeing a large number of older professionals “walk out the door.” While this loss in institutional knowledge can be detrimental, some agencies have seen this as an opportunity to further their TSMO efforts, bringing in new staff and new ideas to help execute new policies. One suggestion from the discussion was for agencies to look into mentorship

programs, so that there is a succession plan for staff when the institutional knowledge is lost through retirement or attrition.

North Carolina DOT Peer Presentation

Meredith McDiarmid of North Carolina DOT presented on TSMO Staffing and Workforce Challenges and Successes. A major challenge within North Carolina DOT is that Human Resources classifications for employees and contracted workers often do not align with TSMO work. As a result, the positions for which the agency is hiring and contracting out work do not have a TSMO focus, and the educational background being recruited does not line up with TSMO efforts. While there are some firms who are good at TSMO planning and design or at TSMO operations, there are very few who are able to make the connection between operations and planning and design. The combination of these issues hinders progress in creating more of a TSMO culture within North Carolina DOT's workforce.

However, North Carolina DOT has found unique methods for success in promoting TSMO. The agency has moved from an Interactive Voice Response (IVR) phone system for their 511 program to a more cost-effective solution. Inmates at a State female prison, who were previously the "back up" option for overflow calls, now handle most travel and tourism information. During large travel events or severe storms, pop up centers are set up to handle the anticipated overflow of incoming calls. This change was able to save North Carolina DOT hundreds of thousands of dollars, and create a traveler information system which could better respond to user needs.

Tennessee DOT Peer Presentation

Jason Oldham of Tennessee DOT presented on his agency's Traffic Incident Management (TIM) program. TIM has been a major focus for the agency, and Tennessee DOT has been working with local agencies and first responders to help all parties involved in response be of one, unified mind and work together effectively. In these efforts, Tennessee DOT created a new TIM training facility, which addresses real world experiences under real world conditions. All responders are able to use this facility to train in various conditions like day-time, night-time, and adverse weather. Responders are then able to practice TIM techniques like parking and blocking, quick clearance, establishing the area, and command responsibilities. Additionally, Tennessee DOT has developed and taught an Advanced TIM training course to meet the specific needs of Tennessee's emergency responders.



Source: Tennessee DOT

Figure 8. Aerial view of Tennessee DOT's TIM training facility.

Discussion

Following the two presentations, participants discussed staffing and workforce development issues. While training was identified in the presentations as a viable solution to some workforce issues, creating positions with competitive pay rates was also seen as an important step for agencies to take to recruit and retain TSMO-specific talent. Additionally, agencies should look for partnerships and opportunities to leverage when conducting staff training. In Nevada, where the State DOT does not have the ability to create a Traffic Incident Management (TIM) training facility like the one in Tennessee, a multi-agency TIM training was conducted on a newly constructed highway prior to the ribbon cutting ceremony. Participants saw enormous value in combining events such as these, which also raises TSMO awareness during events that have high public and leadership attention.

Financial Planning and Funding TSMO

The initial question posed to participants in the Financial Planning and Funding TSMO session was “what funding sources has your agency successfully used for TSMO?” Participants identified a variety of sources, including using safety funds for TIM, funds generated by advertisements on traveler information websites, Highway Safety Improvement Program (HSIP) funding, regional taxes, and State Planning and Research (SPR) funding. FHWA also identified using Congestion Mitigation and Air Quality (CMAQ) funds, and construction and maintenance funds associated with projects to help support TSMO activities associated with those projects. Some agencies identified unique practices for finding funding. In Nevada, it was legislatively mandated that funds from blue interstate signs be used for traveler information services, providing a continuing source of revenue to that program. Washington State DOT incorporated planning efforts into their definition of TSMO, which opened access to planning funds for TSMO projects.

Participants then considered the question “does your agency have a line item or a budget for TSMO?” The general consensus was that TSMO is usually not funded from a separate budget, but that TSMO is included in projects when the business case for TSMO can be made. For example, in Florida, the DOT had data on incident clearance time prior to a budget cut. Following the budget cut, the incident clearing time increased, and the DOT was able to demonstrate the impact of the budget reduction on system performance and reliability and make the case for restoring the funding. Similarly, Maryland DOT and Arizona DOT have been able to use performance measures to justify TSMO.

Performance Management

Many agencies are already looking into new tools that take national performance measures and “dive deeper” into local level data. An interest was expressed by participants in helping MPOs and other local organizations access and analyze data in a way that would lead to the pursuit of more TSMO initiatives.

As participants discussed performance management, they identified a gap in the national performance measures for reliability, since the aggregation of data at the State and regional levels “waters down” the true characteristics of system reliability. As a system-wide measure, the national performance measures do not adequately capture the customer experience on different components of the system nor help to pin-point reliability problems for developing solutions.

Faisal Saleem (Maricopa County DOT) presented a local level solution that had succeeded in Utah, where high fidelity data from the traffic signal controller is utilized to develop Automated Traffic Signal Performance Measures (ATSPM) using a tool developed by Purdue University. This allowed the operator to immediately locate a problem when it was reported by a citizen by going back into the ATSPM charts. When Maricopa County, Arizona applied this model, it was able to locate around 40 signals that needed to be updated in order to mitigate gaps in detection of system performance.

Because different performance measures have varying levels of importance to different interest groups, how performance measures are communicated to different audiences matters. Specifically, for ITS, agencies were curious where successes occurred in communicating the value of ITS infrastructure to less willing partners and organizations. Joe Gregory (FHWA) mentioned that some States are including ITS in their transportation asset management plans (TAMPs), highlighting an opportunity for agencies.

Breakout Group Discussions

Breakout group discussions were held over the course of the Peer Exchange. Participants suggested different topics for discussion related to a key theme and then voted on the topics to discuss. The top three topics for each key theme were picked as breakout groups.

The first key theme was Business Processes, and the group selected *Integrating TSMO into Project Development, Funding and Budgeting*, and *Promoting TSMO in Rural Areas* as the three breakout groups. The second key theme was Leveraging Opportunities to Advance TSMO, and the group selected *What is TSMO?*, *Motivating Agency Staff*, and *Emerging Partnerships, Opportunities, and Coordination* as the three breakout groups.

Business Processes

Integrating TSMO into Project Development

In order to integrate TSMO into project development, partners and stakeholders need to recognize how TSMO will help meet project objectives. Thus, the breakout group focusing on *Integrating TSMO in Project Development* identified a need for TSMO staff, as well as other functional groups, to provide input before the final scope of a project is determined. In particular,



Source: ICF

Figure 9. Presenting on individual group discussions

it is important to obtain input early in the project development process before design decisions are made. By making all interested stakeholders, such as those related to TSMO, safety, bicycle/pedestrian issues, and other topics a part of the conversation, project decisions can better integrate these solutions. Bringing these parties into the early side of the planning process would also help avoid future conflicts, since revisions to the project based on specific inputs could be made before the project turns into a construction site.

A second recommendation from the breakout group was that agencies develop a Maintenance and Operations plan on all integrated corridor management (ICM) projects. Doing so would help agencies and partners to understand up front who owns specific infrastructure and who is responsible for maintenance and operations activities. Another idea was for traffic maintenance plans to include TSMO strategies within work zones (e.g., smart work zones), for which components could be integrated into the resulting project.

Finally, the breakout group suggested agencies create a template for implementation of certain geometries (such as a 12' shoulder), and make that template available to partners whenever they are “touching a freeway segment.” This would allow TSMO to be better implemented during future improvements to corridors, as well as be better considered in current projects. An example given was the construction of a new bridge – an agency may be tempted to decrease the shoulder size in order to reduce the overall cost of the project, but building a larger shoulder on the bridge would allow for future TSMO applications (and multi-modal enhancements), such as the inclusion of potential bus on shoulder use.

Funding and Budgeting

The breakout group focusing on *Funding and Budgeting* found that a common challenge faced by participants was competing priorities within their agencies. They noted that an agency that decides to make TSMO an agency-wide priority will ultimately have more success in funding TSMO projects. Two types of funding mechanisms were identified: large funding programs where projects deemed to have the most merit are funded, and smaller programs which have money earmarked for certain regions or types of projects. In both cases, the breakout group determined that agencies should streamline policies for identifying lower cost TSMO projects (\$3 million to \$15 million) and then finding the appropriate funding mechanism (rather than letting the funding mechanism dictate the type of projects pursued).

A second common challenge faced by participants was the lack of a maintenance budget for ITS equipment. Since this equipment has a cost after being installed, it is important for agencies to identify roles and responsibilities for equipment maintenance.

Overall, the breakout group came back with seven recommendations for funding and budgeting strategies that could be pursued by agencies in the immediate future:

- Build the business case to show why TSMO projects need to be funded
- Develop a 5-year capital plan for Intelligent Transportation System (ITS) equipment and ATMS

- Develop an Information Technology (IT) Strategic Plan
- Develop a life cycle approach for TSMO infrastructure (capital and M&O)
- Look for FHWA Statewide Planning and Research (SPR) and Metropolitan Planning (PL) funding for TSMO planning work
- Identify funding for TSMO projects in district program budgets
- Look at safety dollars for TSMO projects (example, for secondary incidents).

Promoting TSMO in Rural Areas

The breakout group on *Promoting TSMO in Rural Areas* recognized that not all aspects of TSMO, such as recurring congestion mitigation, are necessarily applicable to rural areas but noted that rural areas have some key concerns and opportunities for TSMO, such as festivals which attract large audiences. These situations present opportunities to both apply TSMO solutions and demonstrate the value of TSMO to rural partners. It is important to determine what the public and policy makers in rural areas need, and find TSMO strategies to address those needs. For example, safety can be a major concern for rural communities. The breakout group encouraged agencies to undertake safety campaigns along specific rural corridors and explain the benefits of TSMO to support the safety campaign. These safety campaigns could include TIM trainings for first responders, which are often volunteers in rural areas.

Identifying dedicated funding sources is also important when advancing TSMO in rural areas. Rural policy makers want to see spending outside of urban areas, so having funding available for TSMO efforts in rural areas could help to make the case to policy makers for TSMO. Specifically, benefit-cost ratios can be used to help gain political support and demonstrate to the public why TSMO applications should be supported in rural areas.

Other identified strategies included:

- Conducting ITS “test runs,” with different types of information display messages, which show what useful information can be relayed to rural communities,
- Utilizing GIS to visually display existing and planned ITS infrastructure, and
- Circling back with communities after conducting outreach so rural communities know their feedback has been heard.

Additionally, unique opportunities within rural areas, such as festivals which attract large audiences, present an opportunity to demonstrate the value of TSMO to rural partners.

Leveraging Opportunities to Advance TSMO

What is TSMO?

Throughout the course of the peer exchange, it became clear that not every agency defined TSMO in the same way. This breakout group was suggested and selected by participants who wanted a more concrete answer to the question “What is TSMO?” for them.

The *What is TSMO?* breakout group first considered what TSMO *was not* to help their efforts in determining a definition for TSMO that they could come to some consensus on. The breakout group decided that TSMO definitely was not two things: routine maintenance, such as bringing corridors up to standard condition, and adding pavement to existing roadways. A definition for TSMO emerged among the participants from that discussion, including multiple components:

- Engineering
- Corridor management
- Multimodal/demand management
- Planning and policy.

The group identified that as a road system ages, it comes with opportunities to pursue TSMO strategies. For example, as more users travel on a roadway system, TSMO strategies can be used to reduce congestion before an additional lane becomes necessary. TSMO is identifying those opportunities and implementing measures to “put off” the need to add a lane. It is ultimately about improving reliability and safety across all modes.

The Caltrans TSMO Umbrella (Figure 10) from Nick Compin’s introductory presentation was highlighted as a good example of how an agency can define what TSMO is, since it highlighted the broad reach of TSMO into the agency’s institutional, technical, and operational capacities. Still, definitions of TSMO differ between agencies. For example, Washington State DOT (WSDOT) identified four categories of activities that make up its definition of TSMO: Corridor Management, Demand Management, Minor Operational Improvements, and Planning. A key takeaway from the breakout group was that there are multiple ways of defining TSMO, which may differ between agencies.



Figure 10. Caltrans' TSMO Umbrella

Motivating Agency Staff

The breakout group on Motivating Agency Staff referenced several anecdotes that had been shared over the course of the peer exchange regarding delay, such as the Black Friday road closures in Iowa. These “common enemy” events provide motivation and can spur TSMO efforts in agencies. Further, the economic benefits of a reliable transportation system should be used when making the business case to decision-makers and elected officials, who can use economic benefits to gain public support for TSMO efforts.

Within an agency, TSMO can be furthered with targeted training that creates champions for specific efforts, if those champions are also provided with resources to achieve TSMO goals. Existing opportunities to highlight TSMO, such as the TIM training session alongside a ribbon cutting event, should be pursued. Front-line employees who are doing great TSMO work should be recognized to help promote a positive TSMO culture.

Emerging Partnerships, Opportunities, and Coordination

The Emerging Partnerships, Opportunities, and Coordination breakout group suggested that agencies look first to known and existing partners for opportunities to further TSMO. These existing partnerships will likely provide lower cost and less time consuming results. Beyond that, the breakout group suggested that agencies make time available for pilot projects, which vendors, consultants, and universities are eager to pursue. Especially when these pilot projects can be combined with research projects, funding opportunities through grants can help the agency to offset the total cost of the project. With cost considerations, agencies should look to share the cost of projects between agencies, MPOs, and vendors whenever possible. A cost-sharing plan could help in obtaining executive leadership and higher management support.

The breakout group suggested that States take the lead on innovation, inviting MPOs and partners to scenario planning workshops to determine what the future of the State's transportation system may be. Additionally, it would help local agencies and districts to have a unified data sharing system as they enter the age of Big Data and the Cloud. Unified data formats and access to the same data would help as agencies work together on TSMO efforts.

Implementation: Making it Happen

This session focused on how TSMO strategies are implemented by focusing on two regional consortiums – the Niagara International Transportation Technology Coalition (NITTEC) from upstate New York and the AZTech Partnership from Arizona. Both presentations highlighted the importance of increased collaboration between agencies when implementing new TSMO strategies by showing how participation on content-specific committees informed the individual agencies of regional projects and resources related to TSMO and how those efforts could benefit their agencies. Following the presentations, there was a discussion centered on how to pursue these partnerships without a formalized organization like NITTEC or AZTech.

Niagara International Transportation Technology Coalition Peer Presentation

Athena Hutchins of NITTEC presented on TSMO implementation strategies for the United State-Canada border crossing area. NITTEC is an independent agency in the Niagara region of New York State and Canada which brings together 43 partner agencies on both sides of the border for regional collaboration on transportation. It has several committees that deal with specific subject matter such as border crossing, construction coordination, strategic planning, traffic operations, technology and systems, incident management, and regional transportation signals. These committees help to inform partner agencies on regional efforts, and contribute to regional projects dealing with TSMO, such as border wait time, border crossing traveler information systems, and integrated corridor management. This has allowed the consortium to pursue several grants for projects, such as Integrated Corridor Management (ICM) projects, and deploy new technologies and strategies in the region.



Sources: NITTEC

Figure 101. NITTEC has facilitated the FHWA and Transport Canada Border Wait Time Deployment Pilot Project

Recently NITTEC began the Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Initiative – a \$7.8-million-dollar project aimed to improve border crossing performance and travel time, as well as improve commercial vehicle operations and safety. Commercial freight trucks are both coming into and going out of the region at all times. When massive storms hit, infrastructure can be shut down, posing a problem to these commercial fleets. This project is attempting to better communicate to freight operators what roadways and border crossings are open, to maintain the flow of goods across the border.

AZTech Partnership Peer Presentation

Faisal Saleem of Maricopa County DOT gave a presentation on AZTech, a voluntary organization of 26 partners, including Arizona DOT, Maricopa County DOT, the Maricopa Associations of Governments, cities, towns, and others with a regional focus on implementing TSMO. A benefit to this group of partners is that they are able to produce a central resource database, providing multiple sources of information to system users at one location. At the moment, the organization has a focus on creating standardized job descriptions within its partner agencies to ensure current staff are well-trained for their positions and to generate a pipeline of new, qualified talent. This will help the area in maintaining a workforce that is trained in implementing TSMO strategies by attracting new staff with increased TSMO capabilities.

AZTech is comprised of various committees, each of which focuses on specific training topics for its partner agencies. One of the more recent committees to be established was the Media and

Communications Task Force, whose key objective is to organize a Media and Transportation Forum.

The organization also creates a performance indicators book every two years which covers freeways, arterials, transit, and TIM, among others, in order to promote TSMO to local agency decision-makers. AZTech also produces an Action Plan document, which includes the business case for TSMO. Within this plan, jurisdictions are given opportunities to become champions within specific planning areas as a method to motivate jurisdictions to incorporate TSMO.

Discussion

Participants discussed how agencies could implement TSMO with regional organizations, such as NITTEC or AZTech, as well as how to generate partnerships in the absence of a formal multi-stakeholder organization. Participants agreed that executive support would be needed for any large-scale implementation of TSMO. Additionally, data needs to be shared in proper ways, or it will become costly for agencies trying to implement TSMO – either because data are owned privately and sold to the agencies or because inconsistent data formats will force agencies into collecting and storing their own data.

What's Next? Priorities and Resource Needs

For the final session, participants were asked what information was the most useful for them during the peer exchange. The initial tagline exercise from Day 1 had some appeal, with Maryland DOT saying they were planning on taking the activity back to their communication division. Overall, the Making the Business Case session received a lot of positive comments, since agencies are looking to increase buy in. Participants were encouraged to look at the SHRP2 Business Case Primer on the FHWA and National Operations Center of Excellence websites, which could help agencies in developing their business case for TSMO. Additionally, participants enjoyed hearing how other agencies have succeeded in finding funding for TSMO efforts.

Participants were then asked what resources or services could be provided by FHWA that would be the most beneficial to them. They noted the value of the SHRP2 program and a desire to continue the momentum for TSMO.

“We’ve accomplished a lot, but there is still a lot to do.”

There was a general consensus that the six dimensions of the CMM were broadly applicable and did not need to be refined; however, agencies are interested in what a “perfect score” would look like within an agency. Since most agencies are currently scoring at 1s or 2s on the assessment (out of levels 1 to 4), it would be helpful to see highlights of an agency that has scored a 4 within a specific dimension to help create a vision or a goal.

Other specific resources that participants would like to see from FHWA included:

- Resources to address risk, including examples of exposure to risk and lessons learned. This may include an “exit plan” for when TSMO projects do not work as planned. For

example, when new infrastructure is implemented it needs to be maintained. If the infrastructure is removed due to lack of funds available for its maintenance, then the agency may be liable for increased travel times.

- A TSMO “menu of services,” to aid agencies in marketing TSMO to individuals or organizations who are not immersed in TSMO. Like a menu at a restaurant, this tool would help agencies show potential partners or champions what TSMO could offer them, including a description of what TSMO strategies are and how much it might cost.
- A flow chart on TSMO strategies, to give agencies the ability to quickly show partners or stakeholders what TSMO can offer them and how TSMO would be implemented.
- A continued national push for innovation in TSMO, recognizing that completion of the second Strategic Highway Research Program (SHRP2). In particular, the Every Day Counts (EDC) Program focuses on innovations, and in the past has included some TSMO innovations such as Weather-Savvy Roads. The EDC Program solicits ideas for innovations and this could be an opportunity for continued identification of and efforts to promote TSMO innovations.
- A platform for State DOT chief executive officers (CEOs) to learn about TSMO, given the turnover in political leadership. AASHTO could be a venue for this leadership training on TSMO.
- Development of some more specific CMMs for different elements of TSMO (recognizing that some of these have already been developed).

Finally, participants identified potential opportunities to engage more MPOs in TSMO, and to spread the message about TSMO through organizations such as the Association of Metropolitan Planning Organizations (AMPO) and the Institute of Transportation Engineers (ITE) as promising areas for future focus.

Appendix A – Peer Exchange Agenda

Organizing for Reliability Peer Exchange Agenda

Dates and Times:

February 7, 2018, 8:30 AM to 4:30 PM

February 8, 2018, 8:30 AM to 4:00 PM

Location:

National Highway Institute, 1310 North Courthouse Road Suite 300, Arlington, VA 22201

Day 1: February 7, 2018

8:30 AM	Welcome and Introductions
9:00 AM	Context: Status of Organizing for Reliability Initiative <ul style="list-style-type: none">• <i>Joe Gregory, Federal Highway Administration</i>
9:15 AM	Round-robin: Quick Highlights of Participant Activities <i>Approximately 8-10 participants will each provide no more than 3-minute quick summaries of current experience</i>
10:00 AM	Break
10:15 AM	Communicating the Value of TSMO (Making the Business Case) <ul style="list-style-type: none">• <i>Facilitated Discussion</i>• <i>Presentation: Iowa DOT (Willy Sorenson)</i>
11:15 AM	Changing Agency Culture
11:45 PM	Lunch Break
12:45 PM	Business Processes: Integrating TSMO into Planning and Project Development <ul style="list-style-type: none">• <i>Presentations:</i><ul style="list-style-type: none">○ <i>Maryland DOT (Subrat Mahapatra)</i>○ <i>Florida DOT District 4 (Melissa Ackert)</i>○ <i>Washington State DOT (Monica Harwood)</i>• <i>Facilitated Discussion</i>
1:45 PM	Break
2:00 PM	Business Processes: Breakout Group Discussions

2:45 PM	Report-backs from groups
3:15 PM	Large Group discussion: Emerging Transportation Technologies
4:15 PM	Conclusion
4:30 PM	Adjourn

Day 2: February 8, 2018

8:30 AM	Recap from Day 1
8:45 AM	<p>Round-robin Quick Highlights of Participant Activities</p> <p><i>Approximately 8-10 participants will each provide no more than 3-minute quick summaries of current experience</i></p>
9:30 AM	Break
9:45 AM	<p>Staffing and Workforce Development</p> <ul style="list-style-type: none"> • <i>Presentations:</i> <ul style="list-style-type: none"> ○ <i>Tennessee DOT (Jason Oldham)</i> ○ <i>North Carolina DOT (Meredith McDiarmid)</i> • <i>Facilitated Discussion</i>
10:45 AM	Financial Planning and Funding TSMO
11:15 AM	Performance Measurement: Group Discussion
11:45 AM	Lunch Break
12:45 PM	Breakout Groups based on Morning Topics
1:15 PM	Report-backs from groups
1:45 PM	Break
2:00 PM	<p>Implementation: Making it Happen</p> <ul style="list-style-type: none"> • <i>Presentations</i> <ul style="list-style-type: none"> ○ <i>Niagara International Transportation Technology Coalition (Athena Hutchins)</i> ○ <i>Maricopa County DOT (Faisal Saleem)</i> • <i>Group discussion: How are we going to advance / further implement TSMO</i>
3:00 PM	What's Next? Priorities and Resource Needs
3:45 PM	Conclusion and Wrap Up
4:00 PM	Adjourn

Appendix B – Peer Exchange Participants

Participant Name	Title	Organization
Melissa Ackert	Transportation System Management and Operation Program Manager	Florida Department of Transportation, District 4 (FDOT)
Brent Cain	Transportation Systems Management and Operations, Director	Arizona Department of Transportation (AZDOT)
Solomon Caviness	Special Projects Manager, Planning/Operations	North Jersey Transportation Planning Authority (NJTPA)
Nick Compin	Chief, Office of Strategic Development; Statewide Connected Corridors Project Manager	Caltrans
Hugh Conroy	Director of Planning	Whatcom Council of Governments
Monica Harwood	Workforce Development & Traffic Operations Engineer	Washington State Department of Transportation (WSDOT)
Tom Hein	Public Affairs Manager	Kansas Department of Transportation (KSDOT)
Athena Hutchins	Executive Director	Niagara International Transportation Technology Coalition (NITTEC)
Denise Inda	Chief Traffic Operations Engineer	Nevada Department of Transportation (NVDOT)
Tyler Laing	Systems Program Manager	Utah Department of Transportation (UDOT)
Subrat Mahapatra	Chief, Innovative Performance Planning Division	Maryland Department of Transportation (MDOT) State Highway Administration – Planning
Meredith McDiarmid	State ITS and Signals Engineer	North Carolina Department of Transportation (NCDOT)
Jason Oldham	State Traffic Engineer	Tennessee Department of Transportation (TDOT)

Kelli Raboy	Intelligent Transportation Systems (ITS) Program Manager	District of Columbia Department of Transportation (DDOT)
Joey Sagal	Director, Maryland Department of Transportation - State Highway Administration, Office of CHART & ITS Development	Maryland Department of Transportation (MDOT) State Highway Administration (SHA) - Operations
Faisal Saleem	ITS Branch Manager & MCDOT SMARTDrive Program Manager	Maricopa County Department of Transportation
Willy Sorenson	Traffic and Safety Engineer	Iowa Department of Transportation (IADOT)
Patrick Zelinski	Associate Program Manager	American Association of State Highway and Transportation Officials (AASHTO)
Daniel Grate	SHRP2 / ITS Specialist	Federal Highway Administration (FHWA)
Joe Gregory	Program Manager - Strategic Highway Research Program (SHRP2)	Federal Highway Administration (FHWA)
Tracy Scriba	Team Leader FHWA Office of Operations	Federal Highway Administration (FHWA)
Ralph Volpe	Freight Technology/Operations Specialist	Federal Highway Administration (FHWA)
Beverly Bowen	Senior Technical Specialist	ICF
Taylor Gestwick	Research Assistant	ICF
Michael Grant	Vice President	ICF

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