# AGENCY ENGAGEMENT REPORT

## 2017–2018


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## SUMMARY

During the period of May 2017 to October 2018, the National Operations Center of Excellence (NOCoE) visited the Maryland, Iowa, Washington State, Colorado, and Arizona Departments of Transportation (DOT) to interview senior Transportation Systems Management and Operations (TSMO) officials and their teams. The purpose of these visits was to learn how each DOT has defined, organized, and is carrying out its TSMO functions.

Key learnings from the TSMO agencies included the identification of six characteristics common to all the states NOCoE visited:

1. Strong leadership
2. Prioritization, visibility, and availability of resources to do the job
3. The Importance of culture in breaking down silos
4. TSMO Embodied by a champion at the senior staff level, with or without a defined TSMO division
5. $C^3$: collaboration, communication, coordination
6. Attention to the workforce of the future

If one were to be underscored more so than any of the others, it was the presence of a senior department official with TSMO responsibilities for the organization. This person assesses and understands the underlying conditions the DOT faces, makes the most of what was available, shores up deficiencies, and leverages every opportunity to create an environment where TSMO is integral to the department's vision and mission.

These visits impacted NOCoE's mission and priorities in at least two ways. First, they affirmed the importance of the Center's role both as an advocate for TSMO and as a confluence of services and supports to enhance TSMO activities. Understanding better how each DOT approached its TSMO responsibilities highlighted the key elements that NOCoE needs to support, both through its own promotion and outreach of TSMO and the nature and extent of services it provides to assist agencies in the fulfillment of their mission. Secondly, the visits also underscored the value of collaboration and networking among the DOTs as a community of practice. The Center's role in bringing together the TSMO field and facilitating dialogue and knowledge exchange—whether among state, regional or local agencies or the private sector that supports them—was emphasized by all the agencies visited as a key element in the value that it offers.

Several overarching goals were outlined before the site visits, all of which were achieved. These included:

- Identifying an overview of how TSMO works in the agency, commonly captured by an organization chart or TSMO plan
- Sharing knowledge resources from TSMO plans and organization structures to TSMO webpages and examples of TSMO practices (interestingly, the Center learned that fewer TSMO practices are documented than would have been thought; instead, TSMO reflects "a new way of doing business" that infuses all aspects of the work, both internal to transportation operations, and in

collaboration with other transportation divisions so as to integrate practices and help permeate a transops ethos throughout the department)

- Finding an opportunity to promote the role of NOCoE and to identify state DOT staff to add to the Center's newsletter circulation list and outreach efforts
- Cultivating champions of TSMO to help increase the breadth and depth of TSMO in state and local DOTs around the country
- Providing value to the department's TSMO team and liaisons in other divisions when meeting together to discuss TSMO (what some TSMO officials called "team building")
- Receiving unbiased affirmation that TSMO works
- Gathering a list of potential case studies for the Center to create in order to highlight valuable features of each department's TSMO program

The resulting goodwill among the departments and NOCoE has helped affirm the Center's role as the champion for the TSMO Community as well as being a products and services hub for them.

## KEY LEARNINGS FROM SUCCESSFUL TSMO AGENCIES

There have already been successful efforts to identify the business case for TSMO and the underlying conditions for its success. The business case and underlying conditions are detailed for each state in the individual state reports. These trips have helped affirm the following pre-conditions and support for TSMO in the five states that were visited. These key learnings inform the Center's general approach and communications methods, but they will also become part of NOCoE's *Why TSMO?* Webpage introduction being revamped in 2019.

### The Six Key Learnings

1. **Strong leadership.** In each of the five states, the DOT Secretary/Director either called for the DOT to establish a TSMO focus or gave strong support to the transportation operations activities already in place. The Secretary/Director did not necessarily dictate the conditions for TSMO, but at a minimum helped frame the intended outcomes:
   a. A focus on improving safety and mobility;
   b. Utilization of existing and emerging technologies, not as solutions looking for a problem or shiny objects, but as a means toward applying 21st century tools to reduce fatalities and injuries on the roads, and to limit congestion in the spirit of ensuring a more efficient movement of people and goods, and;
   c. Effective interaction among all of the department's divisions with a view to their existence as an "ecosystem" with all units interdependent on one another to execute the department's mandate.

2. **Prioritization, visibility, and availability of resources to do the job.** DOT leadership ensured that the people or divisions assigned responsibility for TSMO had sufficient resources to carry out their mission. In some cases, this meant more money and staff, but equally important, state DOTs highlighted the purpose, importance, and role of TSMO in the context of other aspects of the DOT's mission (planning, design, construction, maintenance, and asset management) so that the work would be recognized as necessary and valuable, and was actually a contributor to the success of the department's other units.

3. **The importance of culture in breaking down silos.** Organizational culture both contributes to and is the result of how people work together and get things done. There is a cycle to this, from which TSMO has emerged in the last decade. New technologies and the greater ease to work across historically siloed divisional lines has, on paper, made for an easier insertion of TSMO in the larger DOT ecosystem than what was previously possible. Nonetheless, it takes time for new processes to take shape and for organizational units to work more collaboratively. This is fostered by strong executive leadership at the top, and supported by analytics and performance management at the heart of the work to cultivate change. The five DOTs we talked to are at various stages of their department's evolving culture, but all are far enough along to witness reinforcing progress in the changing organizational dynamics.

4. **TSMO embodied by a champion at the senior staff level, with or without a defined TSMO division.** The executive level champion in the form of a DOT's Secretary or Director is important, but the presence of a senior official in the department as the TSMO lead, whether a division director or not, is equally essential. All five states have dynamic, senior staff TSMO champions. Their vision contributes to the operationalization of TSMO goals and objectives and is often supported by a business plan that lays out the principles and means of carrying out management and operations. Each of the five states has a different TSMO "base" from which to work. Some have units that are more expansive than others, taking on traffic safety and regional operations for instance. This does not seem to be a prerequisite for success as other TSMO core elements are either smaller or differently defined, but still focused results. Either way, success is predicated by the next point below.

5. **$C^3$: collaboration, communication, coordination.** As previously stated, TSMO depends on effective interaction with other departmental units within the DOT ecosystem. Given the limited resources available to build new capacity and manage existing assets, TSMO-focused staff must collaborate with all DOT units both early in the life cycle and then during and after construction. In a sense, TSMO is an embedded unit when working well—seamlessly a part of planning, budgeting, and design to ensure that TSMO strategies and management tools are part of the solution. Also, as with refurbishment and modernization of road assets and infrastructure, TSMO is most beneficial when ensuring the ROI of its services are clear to its co-workers and the traveling public that benefits from its services.

6. **Workforce of the future, right now.** The role and effectiveness of TSMO depends on traditional civil engineering skills that while necessary, are no longer sufficient to carry out the transportation operations portfolio. Each of the state DOTs are grappling with this challenge in its own way. All hire varying numbers of professionals from outside the engineering field to augment their staff. Most send a number of their employees to pick up new or more advanced skills from the following main areas: the Operations Academy, Regional Operations Leadership Forum (anticipated), local community colleges, or neighboring universities. Others have in-house training programs. Also, there is an opportunity to collaborate with universities to outsource some services that the university has a better, more nimble skill set to respond to (either through their faculty or students). No one DOT has found the perfect solution, but all affirm that traditional job descriptions are outdated and the workers needed must either be multi-talented or part of a blended workforce to get the job done.

## KEY IMPACTS FROM VISITS

### Capturing Key Impacts

The table below aims to capture two key results sought from the visits, the identification of champions and the impact on The Center's technical services. These impacts, as well as additional aspects of each visit, are expanded upon in the reports on individual states included later in this report.

### Marketing and TSMO Champions

The agency visits during this period coincided with the building of the NOCoE Marketing Plan, in coordination with the Board of Directors, and the start of executing several marketing initiatives resulting from that plan. Therefore the explicit impacts of these visits included additional newsletter sign-ups and general contact with NOCoE resources, which were goals identified in the marketing plan. Another marketing initiative, the development of TSMO Champions, also commenced during this period. This initiative aimed to identify key individuals within state agencies who could serve as communicators and influencers on behalf of TSMO and NOCoE. They were chosen for their ability to speak to both transportation professionals within their department who may not be familiar with TSMO, as well as professionals at the regional and local level about the importance of TSMO. Lastly, the inaugural NOCoE TSMO Awards were launched in mid-2018 and the last three visits allowed for the promotion of these awards directly to TSMO practitioners resulting in Washington DOT and Colorado DOT submitting entries for the awards. Arizona DOT also submitted four entries for consideration, and they won the NOCoE TSMO Award for the Best Project category.

### Technical Services

Additionally, the visits sought to improve the Center's technical service program by talking directly with TSMO practitioners to discover their unique stories as well as their unique needs. This could include the addition of key documents and resources gained from the state, the identification of case studies to be captured, key topics to be covered in peer exchanges or webinars, and the discussion of topics related to upcoming activities, such as summits or National Traffic Incident Response Awareness Week.

*Table 1. Key Impacts of Agency Engagements*

| State | # of Participants | Champions Identified | Technical Service Impacts |
|---|---|---|---|
| **Maryland** | 20+ | Joey Sagal, Director, Maryland SHA<br><br>Subrat Mahapatra, Deputy Director/TSMO Program Manager | • Addition of 30+ resources identifying program development and key partnerships<br>• Incorporation of maintenance as a peer exchange topic (to be executed in 2019)<br>• Case studies via the TSMO Awards |
| **Iowa** | 15+ | Scott Marler, TSMO Director<br><br>Tracey Bramble, Information Specialist | • Video recording for the 2017 National TIM Awareness Week<br>• Helped develop Communicating TSMO webinar<br>• Incorporation of attendees into 2018 TSMO Summit |
| **Washington** | 20 | John Nisbet, State Traffic Engineer<br><br>Ted Bailey, CAT Program Manager | • Two case studies on Amtrak Crash<br>• Additional case studies<br>• Workforce development collaboration projects<br>• Inclusion of resources from UW and WSDOT TSMO resources |
| **Colorado** | 8 | Ryan Rice, TSMO Director | • Case study for TSMO Awards<br>• Additional case studies to be written<br>• CAT related resources to be included in the NOCoE Knowledge Center |
| **Arizona** | 10+ | Brent Cain, TSMO Director | • TSMO Award case studies, including winner and runner-up entries for Best TSMO Project<br>• Additional case studies |

## FIVE STATE REPORTS

### Maryland DOT

Date: May 10, 2017

Attendees: 20+ individuals, including representatives from every department of Maryland's State Highway Association plus law enforcement representatives

Overview: This inaugural agency engagement was organized in coordination with Joey Sagal, Director of the Maryland State Highway Administration. The agenda covered a number of topic areas but the resulting day long engagement ended up being more like a divisional meeting discussing the topic of TSMO and the agencies overall growth in this area. Positive feedback from Joey Sagal focused on NOCoE providing the opportunity and space for his organization to simply meet for a day and discuss their status, progress, and needs. This would become a comment common to each of the site visits.

Additionally, while the Maryland visit included discussion on its TSMO evolution, roles, and key partnerships, this inaugural agency engagement also focused on identifying key documents and resources, which was unique to this visit and is heavily weighted into the results.

#### Business Case for TSMO

The Maryland approach toward TSMO had its roots in the State Highway Administration's creation of CHART (Coordinated Highways Action Response Team): https://chart.maryland.gov/about/overview.asp). Although CHART focused initially on Intelligent Transportation Systems (ITS), these transportation technologies have become the foundation for effective TSMO activities. As has been the case with a number of states, Maryland's Capability Maturity Model self-assessment paved the way for mainstreaming operational strategies.

In 2016, Maryland established a TSMO Strategic Implementation Plan (SIP) that took a goal-oriented approach to integrate TSMO across all of the State Highway Administration, and other modes as well. One of the goals was to "Incorporate TSM&O oriented practices in routine planning and programming business processes." Rather than create a stand-alone TSMO unit, the idea was to ensure the department kept a TSMO mindset in all areas and foster working together routinely to accomplish these goals.

An important component of Maryland's approach is the utilization of performance evaluation studies. The research team at the Civil Engineering Department of the University of Maryland, College Park (UM), has conducted the annual CHART performance analysis for nearly 20 years for the Maryland State Highway Administration (MSHA). The focus of this task is to evaluate the effectiveness of CHART's ability to detect and manage incidents on major freeways and highways, including its operational efficiency and resulting benefits. With the advent of the state's TSMO SIP, performance analysis now extends into a range of areas.

Key to the success of Maryland's integrated approach is that the different organizational units must interact continuously to accomplish their work. The TSMO SIP was prepared with this in mind and ensured that its goals and objectives were clear and captured everyone's role, that mechanisms were in place to foster collaboration and coordination, and that accountability, learning, and continuous improvement were built into the processes that they all worked from. NOCoE's meeting with Maryland personified this approach: representatives from a half dozen departments throughout SHA attended, as did a representative from the Maryland State Police.

Finally, it is worth noting that Maryland, like all states, has taken its stakeholder engagement seriously and through its TSMO planning, worked hard to ensure that the views of all who are impacted by, or have a role in TSMO in Maryland, are partners to the work. From the SIP:

These involvement strategies implicitly recognize that the TSM&O Strategic Plan is:

1. Addressing important concerns for improved performance management in delivering enhanced TSM&O services to MDOT/SHA customers,
2. Setting a decision making process that is a reasonable approach,
3. Listening and hearing concerns of those internally and externally to MDOT/SHA who perceive they are affected while not necessarily trying to act on the concerns of each and every Internal Office and/or External Partner stakeholder, and
4. Concluding, that while a sustainable TSM&O Strategic Plan and Program may be difficult to implement, overall implementing it will be better than not addressing the concerns

## Impact on NOCoE's Technical Services

As mentioned, this visit uniquely identified key resources. In some cases, state DOTs incorporate a TSMO webpage to list information resources and where applicable in this report, the link to these pages is provided. MDOT does not take this approach, but nonetheless has a wealth of resources related to TSMO that merit a listing of documents in the appendix by category and with links.

## Case Studies:

Two key topics were identified for case studies:

- The creation and evolution of CHART
- The approach MDOT uses to engage diverse participation across the agency to address TSMO without establishing a stand-alone unit.

These topics were covered via the Maryland submission to the TSMO Awards program and will be developed into a case study in spring of 2019.

## Peer Exchanges:

A key aspect of this site visit included the coordination of maintenance with the broader highway administration. Key contacts from this and the overall discussion will be replicated and shared via a maintenance peer exchange being planned for summer 2019.

## Iowa DOT

Date: November 6-7, 2017

Attendees: 15+

Overview: The Iowa DOT visit was second in the series of agency engagements organized by the Center. Scott Marler hosted the NOCoE visit and brought in both key staff involved in TSMO, but also two district engineers who offered a valuable perspective on their interface with TSMO priorities and staff. Additionally, Scott invited Neal Hawkins from Iowa State University to sit in. The Iowa DOT and Iowa State University have one of the more expansive collaborations in the country where the University provides TSMO services to support the Department and interfaces well in terms of workforce development support.

### Business Case for TSMO

Like many state TSMO initiatives, Iowa drew from a range of experiences: Strategic Highway Safety Plans, Congestion Management Plans, ITS Deployment Plans, Regional and Statewide ITS Architectures, Regional Concepts of Transportation Ops, Strategic TIM Programs, and the AASHTO Guide to SOM. The FHWA Capability Maturity Model (CMM) process helped shape and refine the process, leading to the launch of the program in the spring of 2016. Coupled with these efforts was significant work to analyze how Iowa roads are used. As a freight corridor state, understanding traffic patterns in all seasons across in both rural and metropolitan areas have helped provide the basis for an effective allocation of resources and the establishment of a ROI necessary to justify the expenditure of the state's limited resources.

Iowa's TSMO program is outlined on the Iowa DOT website (https://iowadot.gov/tsmo/) and incorporates three levels of plans: strategic, program, and service layer plans. Strategic considerations address what and why. The program plan looks at the how, and the service layer plan incorporates specific tools to execute TSMO. (Note the launch presentation that sets the context for Iowa's comprehensive effort: https://iowadot.gov/TSMO/TSMO-Launch-Presentation.pdf?ver=2016-05-05-165651-647).

The DOT's efforts are grounded in Iowa's Vision for TSMO - *Iowa's transportation system is safe, efficient and reliable, supporting the state's environmental and economic health as a result of TSMO*—and its accompanying mission-- *To get you there safely and reliably by proactively managing the transportation system*. At the heart of its work, TSMO depends on successful "service layer" plans for areas like traffic incident management, work zone management, Intelligent Transportation Systems (ITS) and communications, as well as traveler information. That said, the wide ranging discussion affirmed several critical elements that were essential to any success Iowa would achieve. They included:

- The importance of knowing the roads and what travels on them—data is key, and then defining the customer—anyone who uses the roads
- Understanding the challenge of organizational culture and shaping it to embrace TSMO
- Taking the time to make the business case for TSMO

- Establishing a TSMO budget. It is not large, but it has made a difference
- University partnerships are essential and game changing
- Sweating the details: Integrating TSMO into their work processes, building culture (a steering committee of key partners has helped a lot with this)

The Iowa team concluded the extensive discussion by underscoring why the state has invested in TSMO, citing its widely communicated mantra:

> Our roads are busier than ever before. With more drivers on the road, the potential for crashes and increased congestion is greater than ever. The TSMO plan will help us find ways to fine tune the performance of and proactively manage the state's transportation system.

## Impact on NOCoE's Technical Services

Video recording for the 2017 National TIM Awareness Week: This visit coincided with the 2nd Annual National Traffic Incident Management Awareness Week, held by the U.S. DOT Federal Highway Administration. NOCoE agreed to participate in this event, including featuring how TIM is the "backbone for operations" for many states. As part of the discussion, Iowa DOT developed a short, informal, and conversational video to be used by NOCoE and event organizers to highlight the importance of TIM.

Communicating TSMO webinar: Part of this visit included the Iowa Communications Group, including Tracey Bramble who discussed how Iowa leads the way in communicating TSMO both internally and externally. A major result of this visit was a 2018 webinar on Communicating TSMO.

## Washington DOT

Date: June 11-12, 2018

Attendees: 20+

Overview: NOCoE met with over 20 individuals across several WSDOT agencies and regions during a two day site visit coordinated by John Nisbet, Director and State Traffic Engineer from theTraffic Operations Division of the Washington State Department of Transportation (WSDOT). The visit commenced at WSDOT headquarters in Olympia with a focus on interagency collaborations between operations and transit, CAT, and planning. NOCoE was able to meet with Ted Bailey, the CAT Program Manager to discuss how CAT will be incorporated into operations.

The afternoon of first day included a visit to the Olympia Region TIM headquarters, including visiting with TMC operators and Safety Service Patrol providers. This discussion centered on a follow-up on the Amtrak crash response and the case studies that would be published several months later. Additionally, this aspect of the visit included discussions on agency employee performance and development plans which generated a long-term discussion, still underway, on how the Center can support WSDOT and other agencies in assisting with workforce development via these employee development plans.

The second day was spent at a Seattle Region TMC meeting with operators and engineers focused on the major metro region, and included a discussion on how NOCoE can assist with day-to-day transportation operators.

### Business Case for TSMO

Washington takes a holistic approach to TSMO and has not created a stand-alone TSMO unit. Like many states, Washington has seen its responsibility evolve from simple traffic operations to more overarching transportation system management. Everything is connected and the challenge is how best to work across organizational units, each of which has an important role in the system for which WSDOT is the steward. Within the group focused on multi-modal development and delivery, TSMO champions in traffic operations and other units work to integrate a TSMO ethos over the sequence of life cycle functions; from planning and development to construction, operations, and maintenance, followed by performance analysis and strategic assessment. The operations budget is not large, but if it is able to partner with other units to pool resources in a cost effective way, significant results can be gained.

Additionally, the DOT's structure that incorporates multiple modes of transportation beyond roads, calls for further collaboration to enhance the movement of people and goods throughout the wider system.

A TSMO focus, bringing systems thinking to manage the transportation network, depends on participating in the early planning and development stages to influence priorities and funding decisions. Performance metrics help in these deliberations as does effective community outreach. Pilot initiatives to demonstrate the value of TSMO have also been valuable. The incorporation of ITS and the emergence of connected and automated transportation has helped to further nuance the role of TSMO in terms of the high tech elements that can bring significant outcomes to bear. As was stated during the discussions, "it used to be about the technology; now it's about the problem to be solved."

In its public-facing outreach, WSDOT in tandem with the Departments of Health, Commerce and Ecology, has helped frame the conversation around TSMO to answer the question of "What is a transportation efficient community?" The answer:

> Transportation efficient communities support health, prosperous economies, energy conservation and a sustainable environment by requiring less driving to meet daily needs.

This proactive approach to starting the TSMO discussion in the planning stages, as mentioned above, has had success in Washington, helping it shift gears from what many thought, that building more capacity was the only solution:

> Transportation agencies frequently lack the resources or the ability to relieve traffic congestion by expanding the roadway. In response to those limitations, TSMO activities are intended to improve person and freight mobility by maximizing the performance of available facilities, taking advantage of low-cost improvement alternatives, and informing travelers and shippers of expected travel performance and their options. By improving mobility, TSMO activities have a wide-ranging impact on travel accessibility, safety, and reliability, as well as economic vitality, and environmental quality.

More information on Washington's TSMO focus can be found on: http://fratis.trac.washington.edu/TSMO/.

## Impact on NOCoE's Technical Services and Activities

NOCoE is in the process of reviewing Washington DOT's employee performance plan, including their individual performance plan process to identify where NOCoE products and services might be used by DOT staff to further their professional development.

NOCoE attended the Washington State Innovations Conference to discuss workforce development (attended in December 2018).

NOCoE identified several case studies to be developed in 2019-2020 around key successes in Washington:

- WSDOT and TSMO
- Incident Response Teams
- WSDOT's approach toward regional vs. state wide TMCs
- TSMO Application and Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) Approval: Understanding the issues in securing MUTCD approval around signage for TSMO applications, including gaps in recommendations vs. state needs

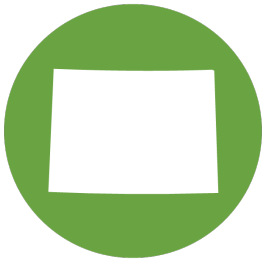
NOCoE captured WSDOT resources to post in the Knowledge Center including:

- WSDOT organization charts/ppt slides showing TSMO (partially complete)
- WSDOT TSMO website: http://fratis.trac.washington.edu/TSMO/?loc=Home.html
- CAV resources (provided by Ted Bailey) (complete)

Additional Next Steps:

- Explore ramp metering strategies in multiple states, perhaps via a webinar, to identify how to address local opposition to this approach (potential peer exchange topic)
- Identify ways in which Washington could enhance its hiring with support from institutions graduating professionals with core entry level skills on top of which the DOT could then offer OJT for specific functions that employees are being hired for (the training demand on the state is quite significant when it is required to teach fundamentals). Explore if the community college model developed by Washtenaw and Michigan DOT offers lessons.

## Colorado DOT



Date: August 1-2, 2018

Attendees: 8

Overview: NOCoE met with each of the division heads within the Colorado DOT TSMO Department, as organized by Ryan Rice, TSMO Director. The first day focused on discussions around Colorado's TSMO story including communications, the incorporation of ITS, and the establishment of a state TSMO evaluation program. Also discussed were Colorado's CAV activities.

The second day focused on the TSMO department's organizational model, key achievements, and key personnel.

The TSMO journey in Colorado evolved under the leadership of its three most recent CEOs. Under Director Hunt, efforts were focused on resetting the department's programmatic focus with greater attention and space given to TSMO. Under Director Bhatt, the importance of technology and ongoing messaging about the value and impact of TSMO was central to the department. With Director Lewis' leadership, institutionalization has been the key. Coupled with stability at the senior and mid-level staffing levels, these changes have taken place effectively and in a long-lasting way. Lewis' depiction of the transportation life cycle—one where the process of planning, budgeting, development, construction, operations, maintenance, management, and performance all interface and flow effectively—speaks to the optimal delivery of transportation services that the public demands.

TSMO's initial creation was not without challenges, but as all units in the DOT became more focused on systems and the goal of efficient and effective movement of people and goods in a safe manner, the interdependencies among units became clear.

### Business Case for TSMO

Like many states, CDOT lauded the value of resources such as the Capability Maturity Model, Regional Operations Forums, the National Operations Academy, and NOCoE. These initiatives have helped CDOT assess the return on investment of TSMO in general and facilitate the integration of project and performance evaluation throughout the transportation system life cycle to assist other divisions throughout the department in considering how best to employ TSMO solutions, e.g., in planning and in the construction/maintenance/operations interface. Two areas where this has had a great impact are corridor management in the mountains, and metro Denver congestion management. The key to making improvements has been to "pick a tangible place to start." The result has been that more gets done and is better coordinated, with tools like ITS incorporated up front rather than after the fact. Finally, the Colorado model has emphasized decentralization (in order to be relationship based and tied to local needs) and coordination with stakeholders outside the department to ensure consensus and long term support.

CDOT's TSMO Division structure has matured since its inception. It now includes four major units under a Division Director that reports directly to the CDOT COO. The units are: Regional Traffic Ops, ITS, Traffic Safety and Engineering, and Planning and Performance. As is the case with a number of state DOTs, CDOT has grappled with nomenclature—what to call the Division: TSMO, Operations, Transportation

Operations, or other. This is a challenge yet to be resolved and branding will remain on everyone's agenda until a satisfactory solution is found.

CDOT has become known as a thought leader in the area of connected and automated transportation, as evinced by a strong CAV component within the TSMO Division and initiatives such as RoadX. That said, the CDOT team concluded its deliberations with NOCoE by asking the question: where is CDOT going; what is its strategic direction?

The value of TSMO has become quite clear in the view of CDOT, but it can still seem like a somewhat fragmented approach to some observers. What is needed is a strategic vision and a concept of operations, that builds on core TSMO planning principles and offers a setting in which highway automation is the context in which the department will operate. CDOT is now engaged in the development of that concept of operations and has partnered with colleagues around the United States to explore how best such an approach would address both the individual needs of Colorado, but also apply to the nation as a whole.

## Impact on NOCoE's Technical Services

The identification of key case studies to capture unique practices by Colorado's TSMO department included:

- Colorado DOT and TSMO
- TSMO Evaluation Program
- Regional Operations

NOCoE's knowledge capture goals of Colorado DOT resources included:

- TSMO evaluation documentation
- Managed lanes evaluation
- Mobility Operations Department slide deck
- CV program framework and related documents
- CAV initiative
- Communications documents for RoadX and other technology implementations

NOCoE continues to work with Ryan Rice to capture these documents.

## Arizona DOT

Date: October 2, 2018

Attendees: 10+

Overview: Brent Cain hosted the Center on a one day visit with Arizona DOT staff.

### Business Case for TSMO

TSMO had its beginnings in Arizona with the state governor's challenge to agencies to adopt "Processes for Daily Improvement." Complemented by the DOT Director's support for a new TSMO division that was fertile ground for new processes and efficiencies, the groundwork was laid for a new way of doing business. With the idea that TSMO was about 1) optimizing performance of existing transportation infrastructure and 2) preserving capacity, improve the safety and reliability of our transportation system, ADOT embraced TSMO. A number of justifications existed to support this. A TSMO approach supported:

- Better alignment with present and future operations
- System preservation and system operations that are more important than ever
- Synergies through improved interagency coordination
- Maximized efficiency of existing infrastructure
- Maximized effectiveness of tools and data for mobility, reliability, and safety outcomes
- Alignment with the national effort - many states are implementing TSM&O
- Advancing technologies

Arizona's TSMO webpage (https://www.azdot.gov/business/tsmo) offers a landing place for other state agencies, non-profits, the private sector and general public to better understand the role of TSMO and its specific activities in support of the broader transportation system. With a strategic plan in place, the TSMO overview is worth sharing.

> Transportation System Management and Operations (TSMO) is an integrated approach to optimize the performance of existing infrastructure by implementing multimodal, intermodal, and often cross-jurisdictional systems, services and projects. This includes regional operations collaboration and coordination activities among transportation and public safety agencies. TSMO is not routine road maintenance like resurfacing or guardrail replacement. TSMO strategies improve system efficiency, enhance public safety and security, reduce traffic delays of road users, and improve access to information for travelers. The emphasis of TSMO is an outcome driven, performance-based system. It is critical that regional operations objectives can be measured since they have importance on a regional level. TSMO strategies include but are not limited to traffic safety, traffic incident management, travel information services, roadway weather information, freeway management, connected vehicles and automated vehicles, traffic signal systems and coordination, work zone management, managed lanes, emergency response and Homeland Security, freight management, active traffic management, and new technologies that are rapidly occurring.

The discussion with ADOT officials confirmed a number of considerations important to any state or local agency wishing to create or sustain a TSMO legacy. In the Arizona story, leadership at the highest levels helped make TSMO happen. Arizona looked at other state experiences to inform its own work before taking steps. Among the considerations it raised were:

- The TSMO Division was created in large part from staff from other divisions and then elevated as an executive level unit
- Other state experiences helped inform Arizona's approach
- Collaboration is important both within the department and in the region
- TSMO is seen as a focal point for innovation; data helps show this and the TSMO vision brings technology advances across all groups together to improve the effectiveness of transportation
- Before TSMO, ADOT had four regional traffic engineers who were segregated, and had very little common interaction (except for traffic design). When TSMO was implemented, all of them report to one structure, with traffic safety, and better data use—it was more unified, included more shared training, and quicker customer service
- TSMO challenges in existing planning processes—projects should not be seen as stand-alone and as a result, TSMO should be, and is invited to sit at the table.

## Impact on NOCoE's Technical Services

The identification of key case studies to capture unique practices by Arizona included:

- Arizona DOT and TSMO
- Ramp metering
- Arizona/Mexico corridor operations management
- DPS/DOT/PIO TMC operations

Additionally, Arizona submitted five case studies to the NOCoE TSMO Awards program, all of which have been published (where linked to) or are under development:

1. Wrong way driving
2. US-60 restriping project
3. Performance Based Needs Maintenance Budget
4. Maintenance Staff Training on TSMO
5. Regional Ops (submitted by MAG but included ADOT)

NOCoE also identified key knowledge resources it would like to obtain for the organization's *Why TSMO?* pages and additional resource sharing:

- TSMO business plan and TSMO Operations Division organization chart
- TIM strategy
- Ramp metering, wrong way driving protocols/practices
- SPaT and CV efforts
- Performance based contracts or specifications
- MOU with DPS and other response agencies

# APPENDIX

## Maryland DOT TSMO Resources

### Administrative:

- CHART Board Membership Roles
- CHART Business Area Architecture
- 2016 Maryland State Highway Mobility Report
- 2016 SHA Annual Report
- 2015 Performance Evaluation and Benefit Analysis for CHART

### TSMO Planning Materials:

- Maryland Transportation Systems Management & Operations (TSM&O) Strategic Implementation Plan
- TSMO Strategic Implementation Plan - Presentation for TSMO Executive Committee Briefing- July 2016
- TSMO Strategic Implementation Plan Development Workshop - July 2015
- TSMO CMM Implementation Plan Workshop - August 2014
- Improving TSMO: Maryland State Highway Administration (MDSHA) Implement Plan Webinar Memorandum (based on CMM Workshop from March 2014)
- Improving TSMO: A Capability Improvement Workshop - April 2013

### Operations Guidelines and Procedures:

- CHART Traffic Management Center Operations - Standard Operating Procedures
- CHART Concept of Operations
- Maryland State Highway Administration Traffic Signal Timing Guidelines and Training Manual

### Traffic Incident Management:

- Maryland Police Chief Association's Resolution on Improving the Management of Traffic Incidents
- Maryland Sheriff's Association's Resolution on Improving the Management of Traffic Incidents
- Final Signed Memorandum of Regional Coordination
- Traffic Incident Management Memorandum's of Understanding (MOUs):
    - Carrol County Sheriff's Office - 2016
    - Montgomery County Fire and Rescue Services - 2015
    - Maryland Department of State Police MOU - 2015 and 'Clear the Road' Attachment
    - Towing & Recovery Professionals of Maryland - 2015