Mainstreaming
Transportation Systems Management and Operations (TSMO)
Using the
Strategic Highway Research Program (SHRP2)

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Changing Transportation Environment

- Challenging fiscal and physical environment limits opportunities for increasing road capacity.
- Heightened customer expectations.
- Increased reliance on information and technology.
- Growing emphasis on measurable outcomes and performance-based management and investment.
- Needs for rebuilding and modernizing infrastructure.
- Emerging technology and data offer opportunities to enhance operations.

A strong foundation for TSMO is critical.
TSMO and Technology

Real-time Data Capture and Management

- Vehicle Status Data
- Infrastructure Status Data
- Weather Data
- Truck Data
- Transit Data

Dynamic Mobility Applications

- Reduce Speed 35 MPH
- Transit Signal Priority
- Weather Application
- Real-Time Travel Info
- Fleet Management/Dynamic Route Guidance
- Real-Time Signal Phase and Timing Optimization
- Safety Alert and Advisories

Data Environment from mobile devices
Transportation Systems Management and Operations

“[A set of] integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects” (MAP-21, (a) (30)).

“Integrated strategies” means:

- Regional integration
- Intermodal coordination
- Interagency collaboration
- Technical integration
How do you describe TSMO?

• Optimizing use of existing facilities.
• Maximizing performance of the system.
• Buying the most mobility for the least cost.
• Treating capacity as an asset to manage.
• Getting you there – people and goods.
• Targeted solutions to congestion causes.
• Complement to capacity projects.
• Flexible approaches to match demand to supply.
Example TSMO Strategies and Solutions

- Work Zone Management
- Traffic Incident Management
- Special Event Management
- Road Weather Management
- Multimodal Coordination
- Freight Management
- Traffic Signal Coordination
- Traveler Information
- Ramp Metering
- Managed Lanes
- Active Traffic Management
- Integrated Corridor Management

Implemented and operated by transportation agencies (State DOT, transit agency, local DOT) on a day-to-day basis.
Evolution of TSMO Strategies

The Past

Conventional Systems
- Traffic Signals
- Ramp Metering
- Incident Clearance

Smart Systems
- Adaptive Signals
- Adaptive Metering
- Incident Management
- Social Media
- Sharing Economy

Integrated Systems
- ICM
- ATM

The Future

- Crowd Sourcing
- Cloud Computing
- CAV
- Smart Cities
- Mobility on Demand
Value of Travel-Time Reliability

- Customers care about predictability of travel.
- Agencies need tools to better understand and identify strategies to improve travel-time reliability.

What travelers experience

Travel time

What they remember

Travel times vary greatly day-to-day

SHRP2 Focus Areas

**Reliability:** Reducing congestion and creating more predictable travel times through better operations.

**Safety:** Fostering safer driving through analysis of driver, roadway, and vehicle factors in crashes, near crashes, and ordinary driving.

**Renewal:** Rapid maintenance and repair of deteriorating infrastructure using already-available resources, innovations, and technologies.

**Capacity:** Planning and designing a highway system that offers minimum disruption and meets the environmental and economic needs of the community.
What is the key factor for explaining the success (or lack of success) of TSMO strategies at transportation agencies?

• It’s not all about $$$$$ or technology deployment.

• It’s about whether effective TSMO processes and organizational capabilities are in place.
<table>
<thead>
<tr>
<th>Characteristics of Effective TSMO</th>
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<tr>
<td><strong>Formal Program</strong></td>
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<td>• Clear mission</td>
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<tr>
<td>• Program/plan/budget</td>
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<tr>
<td>• Processes standardized</td>
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<tr>
<td>• Interoperable technology</td>
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<tr>
<td>• Clear performance metrics</td>
</tr>
<tr>
<td>• Clear roles/responsibilities</td>
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<tr>
<td>• Consistent and proactive</td>
</tr>
<tr>
<td>coordination</td>
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<tr>
<td><strong>Typical TSMO Activities</strong></td>
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<tr>
<td>• Fuzzy mission</td>
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<tr>
<td>• No formal program budget</td>
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<tr>
<td>• Ad-hoc processes depend on</td>
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<tr>
<td>champions</td>
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<tr>
<td>• Changing technology</td>
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<tr>
<td>• Lack of outcome-based metrics</td>
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<tr>
<td>• Stove-piping</td>
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<tr>
<td>• Lack of effective coordination</td>
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Bringing It Together: SHRP2 Helping to Mainstream TSMO

- Emphasis on TSMO is a change. Transformation is needed.
- SHRP2 arrived at just the right time to help.
  - Tipping point.
  - New energy, attention, funding, tools, and capabilities.
  - Helped agencies figure out how to advance TSMO.
  - Created new training and resources for the TSMO workforce.
  - Highlighted the importance of the predictability of travel time and provided new ways to analyze it.
- All this is helping agencies mainstream TSMO as more of a core program integrated within their agency.
SHRP2 Reliability Product “Bundles”

- TSMO Organizational Capabilities
- Reliability Data and Analysis Tools (TSMO Decision Support)
- National TSMO Community
- Advanced Operations Strategies
SHRP2 Reliability Bundle:
TSMO Organizational Capabilities
Dimensions of TSMO Capability

Effective TSMO Strategies

- Business Processes
- Systems and Technology
- Performance Measurement

Collaboration

Organization and Staffing

Culture

{ Business and technical processes

{ Organization and relationships
Levels of Capability Maturity

**LEVEL 1: Performed**
- Relationships & activities ad hoc
- Champion-driven

**LEVEL 2: Managed**
- Processes developing
- Staff training
- Limited accountability

**LEVEL 3: Integrated**
- Processes documented
- Performance measured
- Organization aligned
- Program budgeted

**LEVEL 4: Optimized**
- Performance-based improvement
- Formal program
- Formal partnerships

**Most Agencies Today**

**Ultimate Goal for the Future**
Results – How SHRP2 is Helping

More than 50 States, MPOs, and regional groups have used the assessment to improve TSMO.

[Bar chart showing Before & After Scores for Business Processes, Systems & Technology, Performance Measurements, Culture, Organization & Staffing, and Collaboration. Initial CMM and CMM Re-assessment scores are displayed.]
Results – How SHRP2 is Helping

- Additional attention to TSMO, including at the leadership level and in other DOT units.
- Focused efforts on strategic planning for TSMO.
- Success in gaining buy-in for TSMO from senior leadership and key stakeholders.
- State DOTs reorganizing to make TSMO a higher priority.
- Re-evaluating existing partnerships.
• How to develop, integrate, and sustain TSMO as a core program.

• Three main elements:
  – Strategic
  – Programmatic
  – Tactical

• Looks at:
  – How does TSMO currently fit into my agency?
  – What steps can I take to orient my agency toward TSMO?
  – How do we get there and who needs to be involved?
  – How do we establish and sustain it?

• More than 10 developed by States/MPOs/regions, and about 10 more underway.
SHRP2 Reliability Bundle: Reliability Data and Analysis Tools
The average condition is not the typical condition. Everything else flows from this.

- Data revolution.
- Current tools are useful—more is needed.
- Substantial modeling and analysis advancements.
- Requires a change in thinking and decisionmaking.
- Nascent integration into business practices.
Reliability Data and Analysis Tools: From Data to Decisions

Data Collection
- Establishing a Travel Time Reliability Monitoring System

Analysis
- Effects of Designs
- Highway Capacity Manual
- Benefit-Cost Analysis
- Reliability in Simulation
- Economic Benefits
- Work Zones

Decision
- Reliability in Planning and Programming
• Better understanding of the importance of reliability.
  – New ways to display data to better communicate.

• Greater ability to diagnose causes of congestion issues.

• Modifying processes to integrate TSMO.
  – Integrating travel-time reliability into planning – project and strategy analysis, and investment decisions.
SHRP2 Reliability Bundle: National TSMO Community
Regional Operations Forums allow managers and program leaders at public agencies to build expertise in the emerging field of TSMO and develop a strong network of TSMO peers.

New training to core staff in all States is helping to:

• Mainstream TSMO into Culture
• Strengthen TSMO Programs
• Develop a Multi-State Regional Community of Practice
• Enable Intergenerational TSMO Leadership
• Accelerate TSMO Research Implementation
Launched Jan. 2015
- Collaboration of AASHTO, ITE, ITSA with support from FHWA

Website and Technical Services
- Technical resources
- Calendar of events
- Discussion forums
- Peer exchanges
- Webinars
- Newsletters, and more
SHRP2 Reliability Bundle:
Advanced Operation Strategies
• Interactive, hands on training bringing together police, firefighters, tow operators, medical personnel, and other incident responders.

• More than 326,000 responders trained (28% of 1.15 M).

• Established a national network of TIM training champions.

• Fosters relationship building both in-State and State-to-State.

• Institutionalizing the training - Public safety academies in 39 States have adopted training.
SHRP2 RELIABILITY PRODUCTS HAVE BEEN IMPLEMENTED NATIONWIDE
What This Means For You

• Does your agency’s culture support TSMO?
• Does your agency have a readily identifiable TSMO program?
• Are you ready to communicate the value of TSMO?
• Can you effectively make the case for TSMO investments?
• Are you positioned to provide TSMO capabilities to your DOT customers to fill the gap?
• Has your region built the necessary partnerships?
• Have you tried SHRP2 products to help with this?
Websites and Contact Info

• FHWA SHRP2 Solutions
  www.fhwa.dot.gov/goshrp2/

• FHWA Planning and Organizing for Operations
  ops.fhwa.dot.gov/plan4ops/index.htm

• National Operations Center of Excellence
  www.transportationops.org

• Tracy Scriba, FHWA Office of Operations
  tracy.scriba@dot.gov
Questions?