Regional Operations Forum

Setting the Stage
The Transportation Environment is Changing

- Increased reliance on information and technology
- Technology also offers opportunities – enhanced operations and regional multi-modal integration
- Increasing customer needs and expectations
- Growing emphasis on outcomes and performance measurement
- MAP 21 requirements
- Reduced financial resources
Technology Is Transforming Our World

• Increased availability of information
  o Internet connectivity, wireless communications, cloud computing
  o Information is available 24/7 on mobile devices

• Customers’ perception: technology can improve efficiency and service

• The future – even more innovative technologies and a shorter shelf life
  o New data services
  o Connected / autonomous vehicles

(Source: Portland TriMet)
Customer Expectations and Needs are Changing

- Public’s expectations of government
  - Increased productivity and efficiency
  - Greater demand for accountability – value expected from the use of tax dollars and transit fares
  - Transportation network viewed as a “whole”; not concerned with which agency owns the facility

- Improved performance and service for commuter, freight, recreational, and other trips:
  - Mobility including reduced delays and congestion
  - Safety
  - Accurate, timely, and accessible information
  - Reliability (a focus of SHRP 2 program)
Performance Measures

Element of increased accountability
“The game gets serious when you start to keep score!”
Increasing focus on outcomes – improvements in safety, mobility, reliability, on-time performance, emissions, etc.

Emphasized in MAP 21
Goals and associated measures being established for:

- Safety
- Infrastructure Condition
- Congestion Reduction
- System Reliability

- Freight Movement and Economic Vitality
- Environmental Sustainability
- Reduced Project Delivery Delays
MAP 21 and Performance Based Planning

• MPOs and State DOTs must consider projects and strategies as part of their planning process that promote efficient operations.

• Metropolitan planning processes will use a performance-based approach to transportation decision making:
  o Plan will include performance measures, targets, and system performance report.
  o TIP will link investment priorities to performance targets in Plan to extent possible.
Increasing Financial Constraints

Decreasing fuel tax revenues going into Trust Fund

- No change in the federal gas tax since 1993
  - Predictions that fund will become insolvent soon

- Increased fuel efficiency
  - New CAFE standards
  - Emerging fleet of electric vehicles and plug-in hybrids pay no fuel tax

MUST DO MORE WITH LESS
Traditional Approach to Managing Transportation

- Predict future (long range) traffic volumes
- Fund major capital projects to provide additional capacity

This only addresses 40% of the congestion problem

- Also becoming more and more difficult to provide new capacity

Causes of Congestion (Source: FHWA)
# Urban vs. Rural Congestion

<table>
<thead>
<tr>
<th>CAUSE OF DELAY</th>
<th>CONTEXT</th>
<th>Large Urban Areas &gt; 1m</th>
<th>Small Urban Areas 0.1-1.0m</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>RECURRING CAUSES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand greater than</td>
<td></td>
<td>29-37%</td>
<td>20-26%</td>
<td>0%</td>
</tr>
<tr>
<td>capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor signal timing</td>
<td></td>
<td>4-5%</td>
<td>7-13%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL RECURRING</td>
<td></td>
<td>33-42%</td>
<td>32-33%</td>
<td>2%</td>
</tr>
<tr>
<td>NON-RECURRING CAUSES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crashes</td>
<td></td>
<td>35-36%</td>
<td>19-26%</td>
<td>26%</td>
</tr>
<tr>
<td>Breakdowns</td>
<td></td>
<td>6-7%</td>
<td>6-10%</td>
<td>25%</td>
</tr>
<tr>
<td>Work zones</td>
<td></td>
<td>8-19%</td>
<td>26-27%</td>
<td>39%</td>
</tr>
<tr>
<td>Weather</td>
<td></td>
<td>5-6%</td>
<td>7-10%</td>
<td>7%</td>
</tr>
<tr>
<td>Special events, other</td>
<td></td>
<td>1</td>
<td>&lt;1%</td>
<td>0%</td>
</tr>
<tr>
<td>TOTAL NON-RECURRING</td>
<td></td>
<td>58-67%</td>
<td>67%</td>
<td>98%</td>
</tr>
</tbody>
</table>
What is “Reliability”? 

- Consistency or dependability in travel times
  - As measured from day to day, or across different times of day
- Less tolerance for unexpected delays
- Planning for travel variability has costs for users, including individuals, transit operators, freight and their end users
When We Talk About TSM&O....
What is TSM&O?

Transportation Systems Management and Operations

• “Integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects” (MAP 21)

• Regional integration an important consideration
  o Many strategies are multi-modal
  o All require inter-agency collaboration, including coordinating with enforcement and first responders
Transportation System Management & Operations
Transportation System Management & Operations
The Challenges/Opportunities for TSM&O

• Challenges
  – Congestion and delay are increasing as economy and population grow but capacity is constrained
  – High value placed on reliability
  – Existing TSM&O versus state of practice – unsystematic and developing with “pockets of excellence”

• Opportunities
  – Unexploited potential of aggressive, integrated, collaborative TSM&O applied to existing roadways
Example TSM&O Strategies and Solutions

- Work Zone Management
- Traffic Incident Management
- Special Event Management
- Road Weather Management
- Transit Management
- Freight Management
- Traffic Signal Coordination
- Traveler Information
- Ramp Management
- 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.
TSM&O Can Help Address These Challenges

Leverage Technology
- Preserve and maximize existing capacity
- Enhance safety
- Promote mobility and customer outreach
- Improve reliability for commuters and freight
- Enhance sustainability and livability
- Monitor performance
- Implement quickly at relatively low cost
- Help achieve regional goals
## Remedies to Reduce Delay and Unreliability

<table>
<thead>
<tr>
<th>TSM&amp;O Strategy</th>
<th>Delay Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Control/Ramp Metering</td>
<td>7-8%</td>
</tr>
<tr>
<td>Traffic Responsive Signals</td>
<td>10-12%</td>
</tr>
<tr>
<td>Incident Management</td>
<td>10-15%</td>
</tr>
<tr>
<td>Work Zone Traffic Management</td>
<td>3-4%</td>
</tr>
<tr>
<td>Weather Information</td>
<td>2-3%</td>
</tr>
<tr>
<td>Traveler Information</td>
<td>1-2%</td>
</tr>
<tr>
<td>Active Traffic Management</td>
<td>15%</td>
</tr>
<tr>
<td>Pricing</td>
<td>20%</td>
</tr>
</tbody>
</table>
Supporting Better TSM&O

• System Maintenance
• Partnerships
• Training and Capacity Building
• Project Planning
• Internal/External Coordination
Active Transportation and Demand Management (ATDM)

Broad operational philosophy – an integrated approach for dynamically and pro-actively managing and influencing travel demand and traffic flow

Uses a combination of the real-time operational strategies:

• Those previously noted
• Managed Lanes
• Active Traffic Management
• Integrated Corridor Management
• Dynamic pricing
Transit Management

Example Benefits
- AVL / CAD improved schedule adherence by 9 – 23%
- TSP improved bus travel times by 2 – 15% (minimal impact on side street traffic)

- Automated Vehicle Location (AVL)
- Computer Aided Dispatch (CAD)
- Automatic Passenger Counting (APC)
- Bus Rapid Transit (BRT)
- Transit Signal Priority (TSP)
- Transfer Connection Protection
- Automated Fare Media
Integrated Corridor Management

- Corridors offer opportunities to optimize the entire system
- ICM is the operational coordination of multiple transportation networks and cross-network links
  - Integrated traveler info
  - Operational efficiency of network junctions
  - Cross-network route & modal shifts
  - Capacity and demand

Example Benefits

- ICM along I-15 in San Diego: estimated B/C ratio of 9.7:1
- Simulation of ICM: B/C ratios of 7.1:1 to 25.1:1
Connected Vehicles and the Future

• Vehicles “reading” the roadway and one another
• Collisions reduced; reliability improved
• Smarter operational decisions (possibly predictive)

The Future?
• Technology transformation changes mobility
• What might be the impact of autonomous vehicles?
• DOT role in supporting development
The “Dimensions” of Capability

- Business and technical processes support strategies
- Organization and relationships support processes
Synergism among Dimensions
## Workshop Capability Self-Assessments

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Capability Self-Assessment</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level 1 Performed</td>
<td>Level 2 Managed</td>
<td>Level 3 Integrated</td>
<td>Level 4 Optimizing</td>
<td></td>
</tr>
<tr>
<td>Business Processes</td>
<td>11</td>
<td>10</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Systems and Technology</td>
<td>7</td>
<td>12</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Performance Measurement</td>
<td>9</td>
<td>11</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Culture</td>
<td>8</td>
<td>11</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Organization and Staffing</td>
<td>8</td>
<td>9</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Collaboration</td>
<td>4</td>
<td>12</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
State of the Practice

Business Processes

• Few statewide or MPO TSM&O plans or budgets

• Program planning discouraged – lack funding/program status

• TSM&O not integrated into project development process

• Planners don’t know operations and operators don’t plan

• A few good examples, especially at metro level
Business Processes Implementation Plans

- Define/develop TSM&O “program plan”
  - Business case
  - Capabilities improvements
  - Strategic objectives/investments

- Start at corridor/regional level

- Improve TSM&O planning methods/capacities

- Integrate TSM&O into statewide plan/program

- Insert TSM&O into project development process
State of the Practice

*Systems and Technology*

- Architectures/Concepts of Operations exist – need updating/documentation

- New applications, technologies require ConOps updates, new partners, raise interoperability challenges

- Heavy dependence on consultants

- Challenge of coordination with State Information Technology (IT) departments

- Conventional procurement processes often inappropriate
Systems and Technology Implementation Plans

• Update statewide and regional architectures in keeping with new applications, technologies, and partners

• Consider implications of Integrated Corridor Management and Connected Vehicle applications

• Develop cooperative task force approach to working with State IT agencies
State of the Practice

Performance Measurement

States aware of MAP-21 PM requirements – developing measures, but:

- Measures largely output (events) – *not* customer outcomes
- Data and analytic challenges impede progress
- Measures not used for improving effectiveness (beyond incidents/weather)
- Limited performance-based program accountability (internal or external)
Performance Measurement Implementation Plans

• Create comprehensive performance measurement system with
  – Definitions and measures
  – Related data and analytics
  – Targets

• Incorporate PM in planning and programming processes

• Identify/support internal “clients” for use of measurement

• Use PM business case to communicate benefits of TSM&O to upper management and the public
State of the Practice

**Culture**

- Legacy civil engineering culture with a capital project orientation

- “Can’t build our way out of congestion” accepted but TSM&O business case not widely understood

- Few agencies using operational objectives at policy level

- TSM&O not a “program” – no line item budget/division status

- New technology raising profile of TSM&O (and public expectations)
Culture Implementation Plans

- Develop and communicate business case to top management
- Conduct internal (non-TSM&O) staff familiarization
- Convene internal group to set TSM&O vision and priorities
- Develop outreach program to familiarize public with TSM&O role/benefits
State of the Practice

Organization and Staffing

• TSM&O functions stovepiped – engineering vs. operations

• Variation in degree of centralization vs. decentralization

• Middle manager “champions” 2 to 3 levels down in headquarters/regions

• TSM&O staff small, not a career path, training limited

• Technical capacities difficult to recruit/retain, often outsourced
Organization and Staffing Implementation Plans

• Modify organizational structure to clarify authority/responsibility

• Identify in core capacities needed (vs. outsourcing)

• Ascertain needed skills positions, training/mentoring resources

• Establish career paths and competitive conditions of employment
State of the Practice

**Collaboration**

- Staff recognize criticality of external collaboration

- Some formal agreements developed but interagency collaboration is substantially informal

- Need for alignment regarding performance objectives, needed capacities, and resources

- Co-location and co-training have a positive impact

- Outsourcing widely used and increasing for technical functions
Collaboration Implementation Plans

• Execute/renew agreements with public safety agencies for Incident Management

• Establish forum to improve interagency relationships

• Use corridor projects as pilot for new collaborative operational strategies

• Participate in peer exchanges to share effective public-private partnership arrangements

• Identify more effective forms of public/private partnerships