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Today’s Participants

**Moderator:**
William Hyman, Transportation Research Board, WHyman@nas.edu

**Panelist:**
Steve Lockwood, Parsons Brinckerhoff, LockwoodS@pbworld.com
Agenda

• **SHRP 2 and L06 background (1-9)**
  • L06 Focus and Objectives (11–15)
  • L06 Research: State of Practice (16-19)
  • L06 Guidance Framework (21-30)
  • The Web-based Guidance Demo
  • Question and Answer
SHRP 2 Background

- Authorized in 2005 highway bill at $205 million over 4 years
- ~ $170 million spent over 7 years
  - Roughly $40 million targeted toward traffic congestion
  - Largest emphases on improving safety and renewing highways
SHRP 2 Background (cont.)

- Memorandum of understanding
- Federal Highway Administration
- American Associates of State Highway & Transportation Officials
- National Research Council of the National Academies
- Administered by TRB under cooperative agreement with FHWA
Providing Outstanding Customer Service for the 21st Century

- Safety ($51M)
- Safe Highways

- Great Customer Service
- Better Transport Decisions
- Rapid Renewal and Lasting Facilities
- Reliable Travel Time

- Capacity ($21M)
- Renewal ($32M)
- Reliability ($20M)
The Reliability Focus Area

• Theme 1. Data, Metrics, Analysis, and Decision Support
• Theme 2. Institutional Change, Human Behavior, and Resource Needs
• Theme 3. Incorporating Reliability in Planning, Programming, and Design
• Theme 4. Fostering Innovation to Improve Travel Time Reliability
• Theme 5. Creating Synergy and Integration of Results
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L06 -- Objectives

• Provide a tool to help an agency continuously improve TSM&O effectiveness (performance)

• Self-evaluation—tailored to user’s agency point-of-departure

• Guidance identifies incremental, manageable steps to improving effectiveness
L06 Research Focus

• Why are some agency TSM&O programs more effective than others? (= performance impact)
• Why do some programs seem to make progress while others plateau
• Identify critical components of/preconditions to improving effectiveness:
  • Organization/leadership
  • Processes
  • Relationships
• Incorporate good practice experience into guidance structure for range of agencies
L06 Products

1. Report
   - Survey of agencies TSM&O performance effectiveness
   - Identifies key dimensions determining effectiveness
   - Develop self-evaluation framework (Capability Maturity Model)

2. Detailed guidance for each key institutional & process dimension

3. Develop outreach materials

4. Validation via State DOT/regional workshops

5. Provide basis for a web-based version (AASHTO)
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Background: Challenge/Opportunity

• *Problem:* Highway service deteriorating. Not much new capacity & increase in non-recurring congestion.

• *Opportunity:* Mobility increasingly dependent on managing performance of existing network – not widely understood

• *Challenge to agency:* Need for appropriate processes and relationships to mainstream program improvement.

• *Solution:* Provide guidance -- based on agency current state of play with manageable improvement steps

• *Target:* 21st Century State DOT as Network Operational managers
Increasing Knowledge about Causes of Congestion

- Bottlenecks: 40%
- Traffic Incidents: 25%
- Bad Weather: 15%
- Work Zones: 10%
- Poor Signal Timing: 5%
- Special Events: 5%

Majority of delay/most unreliability caused by “non-recurring” events
But there is a Substantial Difference Between Average and Best Practice
And Much Unexploited Potential

<table>
<thead>
<tr>
<th>SO&amp;M Strategies</th>
<th>Potential Delay Reduction (plus improved reliability)</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>

How can transportation agencies reach the potential of SO&M best practice and Beyond?
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SHRP 2 Survey of Challenges

• Civil engineering Culture: TSM&O not understood
• Programs often (temporary) champion-dependent
• Standard Technical/Business processes unsuitable
• Limited network performance measurement
• Fragmented organization/Workforce KSAs unknown
• Competition for Resources
• Collaboration burden

Bottom line: SO&M is not a “program”
More Effective States Characteristics

The “Program”

Processes that support Program

Supporting Institutional Framework

• What are the Characteristics of an effective program?

• What business & technical process are needed?

• What kind of organization and relationships support the processes?
Capability Maturity Framework

• Adaptation from IT -- The demand for continuous improvement mandated by market - and managed
Key Features of the Operations Capability Maturity Model

- *Dimensions*” of Capability: 6 Critical Process and Institutional characteristics determined in research

- “Levels” of Capability Maturity: establish measurable & meaningful improvement in capability for each dimension

- Guidance based on self-evaluated levels *(Custom-tailored)* to agency level of congestion, user’s position and current agency program characteristics
The Dimensions of Capability

1. *Business processes* -- planning, budgeting, development

2. *Systems & Technology* -- Systems engineering & technology selection

3. *Performance* -- measurement/utilization

4. *Culture* -- understanding/championship of TSM&O

5. *Organization and workforce* -- structure & development

6. *Collaboration* -- public and private
CMM Maturity Levels (for each dimension)

Level 1: Performed
- Activities & relationships ad hoc
- Champion-driven

Level 2: Managed
- Processes developing
- Staff training
- Limited accountability

Level 3: Integrated
- Processes documented
- Performance measured
- Organization/Partners aligned
- Program budgeted

Goal for the future

Level 4: Optimized
- Performance-based improvement
- Formal program
- Formal partnerships

Most of today’s agencies
### CAPABILITY MATURITY SELF EVALUATION (example state)

<table>
<thead>
<tr>
<th>ELEMENTS</th>
<th>LEVEL 1 PERFORMED</th>
<th>LEVEL 2 MANAGED</th>
<th>LEVEL 3 INTEGRATED</th>
<th>LEVEL 4 OPTIMIZING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning &amp; Programming</td>
<td>✗</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systems &amp; Technology</td>
<td></td>
<td></td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Performance</td>
<td>✗</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culture</td>
<td></td>
<td>✗</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization/staffing</td>
<td></td>
<td></td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Collaboration</td>
<td></td>
<td></td>
<td>✗</td>
<td></td>
</tr>
</tbody>
</table>
## Ex: High Level Dimension Criteria

### DIMENSION: PERFORMANCE MEASUREMENT

<table>
<thead>
<tr>
<th>LEVEL 1 PERFORMED</th>
<th>LEVEL 2 MANAGED</th>
<th>LEVEL 3 INTEGRATED</th>
<th>LEVEL 4 OPTIMIZING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some outputs measured and reported by some jurisdictions</td>
<td>Output data used directly for after-action debriefings and improvements; data easily available and dashboarded</td>
<td>Outcome measures identified (networks, modes, impacts); and routinely utilized in common for objective-based program improvements</td>
<td>Performance measures reported internally for utilization and externally for accountability and program justification</td>
</tr>
</tbody>
</table>
### Ex: High Level Dimension Criteria

#### DIMENSION: ORGANIZATION & WORKFORCE

<table>
<thead>
<tr>
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<th>LEVEL 2 MANAGED</th>
<th>LEVEL 3 INTEGRATED</th>
<th>LEVEL 4 OPTIMIZING</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSM&amp;O added on to units within existing structure and staffing; dependence on technical champions</td>
<td>Organizational concept developed within/among jurisdictions with core capacity needs identified; cooperation in field takes place</td>
<td>TSM&amp;O Managers with direct report to top management; Job specs, certification and training for core positions</td>
<td>SO&amp;M senior managers at equivalent level with other jurisdiction services and staff professionalized</td>
</tr>
</tbody>
</table>
The Rules of Improving TSM&O Capability

• The objective is continuous improvement

• All (6) dimensions are essential/synergistic

• Dimension at the lowest level is the constraint

• Levels of capability can not be skipped
## Guidance is Detailed for Actions

(21 X 3 sets)

<table>
<thead>
<tr>
<th>Business Processes</th>
<th>Systems &amp; Technology</th>
<th>Performance Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Planning</td>
<td>• Regional architectures</td>
<td>• Measures definition</td>
</tr>
<tr>
<td>• Scoping</td>
<td>• Project systems</td>
<td>• Data acquisition</td>
</tr>
<tr>
<td>• Programming/Budgeting</td>
<td>engineering/Testing and validation</td>
<td>• Measures utilization</td>
</tr>
<tr>
<td>• Project Development/Procurement</td>
<td>• Standards/Interoperability</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culture</td>
<td>Organization/Workforce</td>
<td>Collaboration</td>
</tr>
<tr>
<td>• Technical understanding</td>
<td>• Program status</td>
<td>• Public safety agency collaboration</td>
</tr>
<tr>
<td>• Leadership/Championship</td>
<td>• Organizational structure</td>
<td>• Local government/MPO/RTPA cooperation</td>
</tr>
<tr>
<td>• Outreach</td>
<td>• Recruitment and retention</td>
<td>• Outsourcing/PPP</td>
</tr>
<tr>
<td>• Program Status/Authorities</td>
<td>• Staff development</td>
<td></td>
</tr>
</tbody>
</table>
Institutional Architectures to Advance Systems Operations and Management

The Guidance Scheme
On paper
(200 pp!)
On-going Steps

• Validation of basic concepts via State/regional self-evaluation workshops with simplified version

• Conversion to web-based guidance tool: (via NCHRP for AASHTO) – now in beta

L06 provides example of use of SHRP 2 research as basis for practice improvements
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AASHTO web-based Guide to Systems Management & Operations
Walk-Through

www.aashtosomguidance.org
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More information

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