“Transferring knowledge about the TSMO practice around the country”

Webinar #3 on TSMO Workforce

TSMO Position Descriptions

Presented by:
Todd Szymkowski
How was the Guidebook Developed?

- Review of good practices and interviews
- Position descriptions identified as vital to future of TSMO were created
- CMM maturity model improvements identified for each position
- Knowledge, Skills, Abilities defined, recruitment concepts advanced
LEADERS with TSMO as a focus can begin creating a team approach.

Assessment of improvement opportunities is conducted.

New needs can be identified, positions modified or new positions created.

Recruitment, Hiring, Retention fits the TSMO focus.

TSMO Leaders can Leverage the Guidebook.
HR Professionals can Leverage the Guidebook

HUMAN RESOURCES professionals help define current, future needs

Adapt existing positions to meet needs is first focus

New needs identified using the specific agency protocols, limits

New positions can be based on Guidebook information
So where do I find?

- Recruiting a TSMO Workforce
- Model TSMO Position Descriptions
- Developing a TSMO Workforce
- TSMO Workforce Retention

NOCoE Website
Before we get into new positions, what about existing ones?

Evolving Existing Positions – Traffic Engineer Example

- Apply principles from civil engineering for traffic operations to achieve effective movement of people and goods.
- Use spatial data, analyses, statistics for data-driven decision making.
- Advocacy for TSMO during planning, design, construction as appropriate.
- Consider connected and automated vehicle impacts on traffic operations.

Positions with Evolution Descriptions In Guidebook:
- Traffic Signal / Arterial Operations Engineer
- Freeway Operations Engineer
- ITS Design Engineer
- ITS Planner
- Transportation Planner
What are the positions?

• 19 different positions descriptions
  • Pick and choose list
  • “starter list” or “building blocks”
  • You don’t need to hire all positions

• Some exist, but not widespread or can be expected to exist in future

• Developed to include:
  • When position might be needed – “Triggers”
  • How it relates to CMM improvement
  • Knowledge, Skills Abilities for position
<table>
<thead>
<tr>
<th>Traffic Data Scientist/Statistician</th>
<th>Cyber Security Engineer</th>
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<tbody>
<tr>
<td>TSMO Manager/Chief/Bureau Director</td>
<td>Transportation Data Ethicist</td>
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<tr>
<td>TSMO Program Manager</td>
<td>Surface Weather Specialist</td>
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<tr>
<td>Computer Engineer</td>
<td>Systems Engineer</td>
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<td>Artificial Intelligence Scientist</td>
<td>TSMO Modeling Specialist</td>
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<td>Telecommunications Engineer</td>
<td>Emerging Technologies Industry Liaison</td>
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<td>Data Management Specialist</td>
<td>Transportation Systems Performance Manager</td>
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<td>Visualization Specialist</td>
<td>Integrated Corridor Management Manager</td>
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<tr>
<td>Connected and Automated Vehicles (CAV) Program Manager</td>
<td>Transportation Management Center Manager</td>
</tr>
<tr>
<td>Traffic Incident Management (TIM) Program Manager</td>
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[https://transportationops.org/workforce/model-tsmo-position-descriptions](https://transportationops.org/workforce/model-tsmo-position-descriptions)
What motivates your organization to change its face(s)?

<table>
<thead>
<tr>
<th>Position</th>
<th>Motivations</th>
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</table>
| Traffic Data Scientist / Statistician | • TSMO relies on effective extraction and manipulation of “big data”  
• Growing opportunity and expectation for data-driven decision-making, including advanced pattern recognition and statistical methods  
• Spatial data requires combining expertise in geographic information systems (GIS), statistics, data science, visualization, and web applications |
Illustrating CMM Improvement Potential

- Developed Concept Analogous to Right vs Left Brain
  - Right Brain (Management) – More Creative and Artistic
    - Collaboration
    - Organization/Staffing
    - Culture
  - Left Brain (Operations) – More Analytical
    - Business Processes
    - Systems and Technology
    - Performance Management
- The more the radial graphs are filled out the higher potential to improve CMM category
Capability Maturity Model
Improvement Potential

Integrated Corridor Management Manager
Typical TSMO Program CMM Level: 2-3

Improvement Potential

Collaboration  Business Processes
Organization /Staffing  Systems and Technology
Culture  Performance Measurement

Area of Improvement:  Management  Operations

Legend

Area of Improvement

Management  Operations

Collaboration  Business Processes
Organization /Staffing  Systems & Technology
Culture  Performance Measurement

CAV Program Manager  Cyber Security Engineer  Data Ethicist  Data Management Specialist
Emerging Tech Industry Liaison
Integrated Corridor Management Manager  Traffic Data Scientist / Statistician  Transportation Systems Performance Manager  Visualization Specialist  TSMO Modeling Specialist

Computer Engineer  Systems Engineer  Telecom. Engineer  TIM Program Manager  TMC Manager
EXAMPLE - WHEN AND WHY TO HIRE?
• The agency is looking to enhance their TSMO program by improved weather condition connectivity
• Weather data needs integration with other TSMO activities for performance assessment and improvement
• Interest in improving TSMO applications by adapting to real-time and predictive weather effects
TSMO Manager/Chief/Bureau Director

- Management Level position responsible for:
  - Influencing organizational culture
  - Developing internal and external partnerships
  - Building organizational TSMO capacity

TSMO Program Manager

- Tasked with developing overall TSMO Program
- Needs authority to cut across organization
- Needs to know “a little” about everything
Computer Engineer

- Recognizes TSMO’s growing needs:
  - Cyber infrastructure
  - Command and control
  - Automation
  - Software
  - Computing capabilities
  - Remote sensing

Artificial Intelligence Scientist

- AI is creeping into many DOT functions
- Underlying basis for many systems within TSMO
  - Nonlinear Prediction
  - Control Functions
  - Pattern Recognition
  - Clustering
  - Planning
  - Decision Making
<table>
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<tr>
<th>AI Function</th>
<th>Transportation Uses</th>
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</thead>
<tbody>
<tr>
<td>Nonlinear Prediction</td>
<td>Traffic demand modeling; modeling the transportation infrastructure health as a function of traffic, construction and weathering.</td>
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<tr>
<td>Control Functions</td>
<td>Signal control of traffic at road intersections, ramp metering on freeways, dynamic route guidance, and traffic flow harmonization</td>
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<tr>
<td>Pattern Recognition</td>
<td>Automatic incident detection, image processing for traffic data collection and for identifying cracks in pavements or bridge structures and transportation equipment diagnosis.</td>
</tr>
<tr>
<td>Clustering</td>
<td>Identifying specific classes of drivers based on driver behavior.</td>
</tr>
<tr>
<td>Planning</td>
<td>Support simulation and activity-based models.</td>
</tr>
<tr>
<td>Decision Making</td>
<td>Deciding whether to build a new road, how much money should be allocated to maintenance and rehabilitation activities and which road segments or bridges to maintain, and whether to divert traffic to an alternative route during a traffic incident.</td>
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</tbody>
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Telecommunications Engineer

- Growing needs related to low latency telecommunications for wireline and wireless applications
- Increasingly complex DOT-owned or leased communications networks

Data Management Specialist

- Expected growth in massive amounts of operations data
- Big Data Architecture
  - Collection
  - Preparation - New techniques for data compression, Imputation
  - Analytics
  - Visualization
  - Access
Visualization Specialist

- Work closely with Data Management Specialist
- Applications SME that uses data to tell the TSMO story through visualization
- Visualization to improve operations

Connected and Automated Vehicles (CAV) Program Manager

- Some DOTs have already dedicated CAV positions
- Many Roles
  - Policy
  - Legislation
  - Technical Lead
  - Economic Development
## Expanded Research - CAV Talent Needs

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<tr>
<th>Advanced Driver Assistance Systems</th>
<th>Electrical Systems and Components</th>
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<tr>
<td>App Development</td>
<td>Information Security</td>
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<tr>
<td>Applied Data Analytics</td>
<td>Mid-Level Engineering Managers</td>
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<tr>
<td>Artificial Intelligence</td>
<td>Programming</td>
</tr>
<tr>
<td>Auto Testing/Development</td>
<td>Robotics Engineering</td>
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<tr>
<td>Autonomous Vehicles</td>
<td>Software Development</td>
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<tr>
<td>Business Analytic Tools</td>
<td>Software Engineering</td>
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<tr>
<td>Coding</td>
<td>Statistics Modeling</td>
</tr>
<tr>
<td>Connected Vehicle Technologies</td>
<td>System Engineering</td>
</tr>
<tr>
<td>Cybersecurity</td>
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Sources: CAR Research; Oakland County, Michigan Skills Needs Assessment Project; WIN CAV Skills Gap Analysis
Traffic Incident Management (TIM) Program Manager

- Some DOTs have dedicated staff
- Primary contact between DOT and Emergency Responder Partners
- Coordinates TIM training, After Action Reviews, Routine partner engagement
- Tracks TIM Performance Measures and Targets

Cyber Security Engineer

- Additional IT and operational technology (OT) systems and field devices increases cyber infrastructure vulnerability
- CAV security is a major growth area
Transportation Data Ethicist

- Bigger Role for Data Protection and Privacy Policies in Transportation
- "With massive amounts of data comes great responsibility"
- Authority on public sector collected information, so it does not violate privacy laws, rules, or expectations

Surface Weather Specialist

- Climate change seems to be having more profound impact on transportation network
- Integrate Meteorology expertise into real-time TMC operations
- FEMA Incident Meteorologist (IMET) certification desirable
Systems Engineer

- Increasingly complex systems being built and maintained by DOTs
- Planning and operations function
- Supports integration of across different types of networks

TSMO Modeling Specialist

- Not microscopic, not macroscopic, but somewhere in between (mesoscopic)
- Growing needs to model integrated corridor management and other smart city techniques
Emerging Technologies Industry Liaison

- Government (DOTs) can be intimidating to work with
- Creates a “storefront” for businesses to engage
- Sometimes connected with state economic development organization

Transportation Systems Performance Manager

- Dedicated staff tracking ongoing transportation network and organizational performance
- Institutes culture of continuous improvement
Integrated Corridor Management Manager

- Staff dedicated to making corridor(s) function as best they can
- Multimodal
- Authority to make changes without too many hurdles

Transportation Management Center Manager

- Many states have position, but need to further professionalize as TMCs become more and more sophisticated
Position Descriptions Include:

- Job Category
- Minimum work history
- Applicability to different agencies
- Education
- Certifications and licensure
- KSAs

## Summary of Position

### Roles & Responsibilities

1. **Managerial**
   - Strategic Planning
   - Customer Service
   - Project Management

2. **Technical**
   - Other

### Percentage of Time

1. **1.0 Managerial**
   - Direct and supervise staff
   - Ensure working objectives are met
   - Evaluate employees' performance
   - Communicate regularly
   - Ensure that all procedures are followed
   - % of Time: 100%

2. **2.0 Strategic Planning**
   - Develop and implement TSMO business plan
   - Collaborate with others in plan development
   - % of Time: 100%

3. **3.0 Customer Service**
   - Participate in meetings
   - Maintain professional relationships
   - % of Time: 100%

4. **4.0 Project Management**
   - Develop and manage contracts
   - % of Time: 20%

[Link: https://transportationops.org/surface-weather-specialist]