Housekeeping

A few notes:

• Your mic will be kept muted during the duration of this webinar to cut down on background noise

• Feel free to submit questions in the question box; we will hold Q&A after all presenters have spoken

• This webinar will be recorded and posted to the working group webpage 48 hours after the meeting
Today’s Agenda

1. Welcome
   Caitlin Cook, AMPO

2. Introductions
   Eric Hill, Metroplan Orlando

3. The Smart Mobility Revolution
   Bob McQueen, Bob McQueen & Associates

4. Metro’s Approach to Emerging Technology
   Eliot Rose, Metro

5. Transferring Knowledge About the TSMO Practice Around the Country
   Niloo Parvinashtiani, National Operations Center of Excellence

6. Q&A
Meet the Speaker

Bob has a broad range of experience in the application of advanced technologies to transportation, gained in assignments over the past 30 years. In the past five years, Bob has worked with a major international big data and analytics solution provider on the application of big data and analytics to smart cities, connected and autonomous vehicles, and other transportation applications. He is a creative problem solver with superb verbal and written communication skills, combined with proven traffic and transportation, big data, analytics and business process management capabilities. He is an expert in communication complex concepts in a straightforward way. Bob has a unique combination of skills that enable him to act as a bridge between transportation and data science:
The Smart Mobility Revolution

- Bob McQueen
- Chief Executive Officer
- Bob McQueen and Associates
- 407-491-2842
- Bob@BobMcQueenandAssociates.com
Bob McQueen

- More than 30 years in transport
- Started career in UK public sector
- Worked in video inventory data collection and management for 3M in mid 80s
- Managed international business development for Iteris Roadway Sensors
- Provided high level consulting to public clients in USA, Europe, Middle East, Asia Pacific
- Part of graduate faculty at University of Central Florida
- Resides in Perpignan in the south of France
- Global mobility consultant

- Provided strategic business advice to a number of public and private sector clients including:
  - SANDAG, Florida Department of transport, Florida’s Turnpike Enterprise, Lynx, San Francisco County transport Authority, North Texas Tollway Authority, USDOT, FTA
  - Rockwell Collins, LG CNS, Samsung, Federal Signal, Egis transport Systems, Peek Traffic USA, Vigilant Solutions, Teradata

- Strengths
  - Explaining complex concepts
  - System architecture, engineering and planning
  - Advising on use of advanced technologies
  - Strategic Business management
  - Market analysis and planning
Topics and Presentation Objectives

1. **Introduction**
   - Bob McQueen
   - Presentation Objectives

2. **Smart cities**
   - Definition
   - Services

3. **Mobility**
   - Revolution
   - Consequences
   - Completeness

4. **Emerging**
   - Automated driving systems
   - Mobility as a Service
   - Blockchain
   - Urban Air Mobility
What are Smart Cities?

- Fixed visual surveillance
- Mobile video capture and recording
- Digital evidence management
- Early warning systems
- Officer wearables
- Next-gen emergency
- Smart campus
- Smart stadiums
- Smart ports
- Open data

- Connected back office
- Smart kiosks
- Advanced public transit
- Smart outdoor lighting
- Smart public buildings
- Smart trash collection
- Smart city platforms
- Digital twin
- Real-time crime centers
- Smart mobility
Smart Mobility Revolution: Consequences

- Sudden dramatic change
- Needs understanding and adaptation
- New business models
- Emerging technologies

Public
- New role as advocate and influencer
- New role as mobility service broker
- Extreme agility required to keep pace with technology
- Changes in procurement methods required
- Workforce changes required to support the new environment

Private
- Clear understanding of problems and needs
- Effective dialogue with the public sector
- Detailed understanding of new business models
Complete: across transportation

**Planning**
- Planning & operations are disjointed
- Need more effective investments in transportation infrastructures
- Lack of alignment between supply & demand
- Better understand cause/effects of transportation needs
- Need better predictions & forecasts

**Design**
- Reinventing the wheel
- Hard to get data from previous projects
- Lack of evolutionary cost database

**Delivery**
- Inefficiencies in project delivery
- Poorly managed projects
- Long duration of projects
- Delayed benefits to users
- Regulatory burdens strangle process

**Operations**
- Ops not as efficient as they could be
- Ops influenced by rumor and guesswork rather than scientific
- Data is not being turned into strategies
- Ops across modes are not well coordinated
- Data is not being repurposed for planning

**Maintenance**
- Different performance levels by device
- Hard to know when is best time to replace devices
- Hard to pick the right level of maintenance quality
- Difficult to create business case for maintenance spending
- Lack of knowledge about maintenance costs
Asset management
Understanding and managing fixed assets, mobile assets and applying predictive maintenance techniques to both.

Enabling services
A range of services that do not provide direct benefit but provide enabling support for the other services.

Analytics
The application of big data analytics techniques to guide all aspects of mobility in urban environment. This includes smart land-use analytics.

Mobility management
Integrated mobility management across all modes including freeway management, arterial management: urban surface streets control, transit management, smart Metro.

Connected and automated
Connected and autonomous vehicles for probe vehicle data to reduce reliance on infrastructure-based sensors. Using autonomous vehicles for first mile, last mile shuttles and freight deliveries in urban areas.

Connected citizens and visitors
Smart phone apps and central back office information processing to push information to citizens and visitors and pool crowdsourcing information from them. Using people as probes.

Integrated payment system
Combining electronic toll collection with electronic ticketing for transit and electronic fee collection for parking to provide an integrated payment system for the entire smart city. This can also form the basis for the conductivity required for connected citizens and visitors.

Smart grid and electric vehicles
Smart energy management including roadway electrification and the deployment of electric vehicles. Requires analysis on the best placement of electric vehicle charging points and analysis of the art impact of electric vehicles on both mobility and energy consumption.
## Complete Planning

<table>
<thead>
<tr>
<th>Adapt</th>
<th>Advise</th>
<th>Align</th>
<th>Connect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop flexible and adaptable infrastructure and management systems that conforms to demand changes</td>
<td>Provide regional travelers with decision quality information in the right place at the right time</td>
<td>Public-public and public-private partnerships that are equitable and sustainable. Organizational alignment to goals</td>
<td>transport as a single system, with appropriate interconnections and service synchronization.</td>
</tr>
<tr>
<td>Guide</td>
<td>KnownGo</td>
<td>Moneywise</td>
<td>People 1st</td>
</tr>
<tr>
<td>Develop informed policies that achieve results and harness private sector innovation. Based on observed data and analytics</td>
<td>Mobility as a service to enable travelers to make the best decisions and discover the best way to get there</td>
<td>Results driven investments that integrate infrastructure, technology and services</td>
<td>Understanding and providing for the needs of citizens and the evolving workforce</td>
</tr>
<tr>
<td>Powerflex</td>
<td>Sentient</td>
<td>Tapestry</td>
<td>Worksmart</td>
</tr>
<tr>
<td>Clean flexible energy, environmental preservation, fuel efficient regional transport</td>
<td>Managing growth to achieve balanced objectives by applying knowledge and wisdom</td>
<td>Interwoven technologies that align with infrastructure and services to reinforce each other</td>
<td>Incorporation of best practices and lessons learned nationally and internationally</td>
</tr>
</tbody>
</table>
Emerging technologies: Automated driving systems

Society of Automotive Engineers (SAE) Automation Levels

0. NO AUTOMATION
   - Zero autonomy, the driver performs all driving tasks.

1. DRIVER ASSISTANCE
   - Vehicle is controlled by the driver, but some driving assist features may be included in the vehicle design.

2. PARTIAL AUTOMATION
   - Vehicle has combined automation: no control over steering and acceleration and deceleration. The driver is expected to monitor the environment and may have the option to take control of the vehicle at all times.

3. CONDITIONAL AUTOMATION
   - Driver is a necessity, but is not required to monitor the environment. The vehicle is capable of performing driving functions under certain conditions. The driver may have the option to take control of the vehicle.

4. HIGH AUTOMATION
   - The vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle.

5. FULL AUTOMATION
   - The vehicle is capable of performing all driving functions under all conditions. The driver may have the option to control the vehicle.

AMPO.ORG
Emerging technologies: Mobility as a Service

- Mobile apps
- Complete trip support
- Information
  - Choices
  - Quality
- Single reservation
- Single electronic payment
Emerging technologies: Blockchain

- Distributed
- Immutable
- transparent
- No third party
- Faster, cheaper
- Tamper evident
- More secure
- No single point of failure
- Privacy

“The blockchain is an incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value.”
Don & Alex Tapscott, authors Blockchain Revolution (2016)
Block chain use cases

Operator

- Fraud detection
- Demand management
- Asset management
- Connected citizen and visitor
- Integrated payment
- Electric vehicle payment
- Toll payment

End user

- Mobility as a service
- Crowdsourced data
- Service optimization
- Android pay
- Apple pay

- Mobility as a service
- Crowdsourced data
- Service optimization
- Smart app payment
- Android pay

Parking fee payment
Parking analytics
Transit analytics
Toll analytics
Transportation management
Urban analytics
Emerging technologies: Urban Air Mobility

**Aircraft**
- Design
- Production
- Airworthiness
- Type certification

**Infrastructure**
- Operations
- Maintenance
- Design

**Pilot**
- Aeronautical knowledge
- Flight proficiency
- Aeronautical experience
- Pilot licensing

**Air traffic management**
- Traffic management system
- Onboard sensors
- Autonomous operation
- Integration with wider air traffic control.
Urban Air Mobility (UAM)

- Automated or manual pilot
- Less than 55lbs
- More than 55lbs
- Electric
- Vertical take off and landing
- Range: 60 to 300 mile
- Altitude: 400 to 2000 ft
- Passenger or goods
UAM primary applications & challenges

Last mile delivery
Packages less than 5 pounds
Upon demand
Dispatched from online orders

Air taxi
Near ubiquitous door-to-door ridesharing operation
Unscheduled and on demand
Vehicles are autonomously operated
2 to 5 passengers at a time

Air metro
Like current transportation options such as subways and buses
Predetermined routes
Regular schedules
Identified stops in high-traffic areas
Vehicles are autonomously operated
2 to 5 passengers at a time

Challenges
• Certification
• Integration with existing transportation
• Public acceptance
• Public and private sector working together
• Organizational capabilities
Opportunities

- First Mile
  - Private car
  - Electric scooter
  - Walk
  - Rideshare
  - Bicycle
- Middle mile
  - Airplane
  - Bus
  - Hyperloop
  - Air metro
  - Air taxi
- Last mile
  - Rideshare
  - Walk
  - Walk
  - Rideshare
  - Taxi
Summary

1. Introduction
   - Bob McQueen
   - Presentation Objectives

2. Smart cities
   - Definition
   - Services

3. Mobility
   - Revolution
   - Consequences
   - Completeness

4. Emerging
   - Automated driving systems
   - Mobility as a Service
   - Blockchain
   - Urban Air Mobility
Meet the Speaker

Eliot Rose is a transportation planner at Metro. He leads Metro’s Emerging Technology program and long-term transit planning efforts for the Portland metropolitan area. Eliot has ten years of experience in the public and private sector helping transportation agencies address new and pressing issues like emerging technology, equity, public health, and climate change. He holds a Master’s Degree in City and Regional Planning from the University of California, Berkeley.
Metro’s approach to emerging technology

AMPO

March 11, 2018
### Transportation habits are changing fast

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uber/Lyft trips</td>
<td>12m</td>
<td>0</td>
</tr>
<tr>
<td>Bikeshare trips</td>
<td>400k</td>
<td>0</td>
</tr>
<tr>
<td>Scooter trips</td>
<td>700k</td>
<td>0</td>
</tr>
<tr>
<td>Shared cars</td>
<td>&gt;1,000*</td>
<td>&lt;100</td>
</tr>
<tr>
<td>Rank of smartphones</td>
<td>#1</td>
<td>#3</td>
</tr>
<tr>
<td>a source of travel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>info</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekly bus trips</td>
<td>1.05m</td>
<td>1.15m</td>
</tr>
</tbody>
</table>
Why is regional planning for emerging tech important?

Where do we most need new options?

Where are we getting the most new options?
Emerging technologies

- Automated vehicles (AVs)
- Connected vehicles (CVs) and CV infrastructure
- Electric vehicles (EVs)
- Transportation network companies (TNCs)
- AV/EV transit vehicles
- Microtransit
- Car share
- Bike share
- Travel information and payment
- New data sources
Policy priorities and approach

- Understand today to shape tomorrow
- Acknowledge uncertainty
- Embrace “speedy incrementalism”
- Work at the intersection of technological innovation and community innovation
What’s Metro doing?

Plan the transportation system to meet regional goals

Guide innovation and to advance equity and improve travel options

Two-year emerging tech program
2018-20 emerging tech program

**PILOT program** fosters partnerships and firsthand information / experience

**New data and tools** to plan for and manage emerging tech

**Regional policy coordination** on new mobility options

**State and federal policy advocacy** to maintain local and regional authority to do what’s best for the public
PILOT program goals

**Goal 1: Test** new approaches to improving shared, active, and equitable transportation using emerging tech

**Goal 2: Collect information** to understand results, benefits, and challenges

**Goal 3: Develop partnerships** across sectors that lay the groundwork for future success
# 2019 PILOT projects

<table>
<thead>
<tr>
<th>Project partners</th>
<th>Project name / description</th>
<th>Grant amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>APANO, ROSE CDC, PBOT, various companies</td>
<td>New Mobility at the Orchards of 82nd: Provide Jade District residents with accounts that they can use to pay for transit and a variety of new services, as well as education to help them access new modes.</td>
<td>$30,000</td>
</tr>
<tr>
<td>Latino Network, Uber, TriMet</td>
<td>Latinx Ride Share Promotion: Provide ride-hailing credits and travel assistance to help Latinxs reach educational programs and services at locations throughout the region</td>
<td>$55,000</td>
</tr>
<tr>
<td>OPAL, Portland Transport, Rosewood Initiative</td>
<td>East Portland Transit Appliance: Install screens displaying real-time information on transit arrivals at community locations in East Portland near lines with increased transit service</td>
<td>$30,000</td>
</tr>
<tr>
<td>Ride Connection, Full Path, Trillium Transit</td>
<td>Trip Planning for All: Develop a trip planning tool that provides information on demand-response / special needs transportation services in the region</td>
<td>$35,000</td>
</tr>
</tbody>
</table>
What outcomes can we achieve through this approach?

- Improved connections to transit
- New shared / active options
- Equitable access
- Better travel information and incentives
- Supporting other projects

LOIs  Applications  Awards
<table>
<thead>
<tr>
<th>Goal</th>
<th>Successes</th>
<th>Opportunities to improve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advance equity and transportation choices</td>
<td>Equity</td>
<td>Choices</td>
</tr>
<tr>
<td>Form partnerships</td>
<td>Non-profit / private</td>
<td>Public agency partners</td>
</tr>
<tr>
<td>Support work across the region</td>
<td>2 regional projects</td>
<td>No local projects outside of Portland</td>
</tr>
<tr>
<td>Leverage resources</td>
<td>$95K in match</td>
<td>Aligning with partner projects, reducing partnership risks</td>
</tr>
<tr>
<td>Engaging / equitable process</td>
<td>Formed new partnerships and fostered engagement</td>
<td>Hard to understand what Metro wants</td>
</tr>
</tbody>
</table>
Data: regional micromobility dashboard

Operator Filters
- Bird
- JUMP
- Lime
- Spin
- Skip
- Lyft

Recently Unavailable Filter
Available

Vehicle Type Filters
- Show bicycles
- Show scooters
- Show cars

Parked Duration Filter
Include all

Count by Operator

<table>
<thead>
<tr>
<th>Operator</th>
<th>In</th>
<th>Out</th>
<th>Max</th>
<th>Uniq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bird</td>
<td>107</td>
<td>0</td>
<td>160</td>
<td>661</td>
</tr>
<tr>
<td>JUMP</td>
<td>107</td>
<td>0</td>
<td>132</td>
<td>169</td>
</tr>
<tr>
<td>Lime</td>
<td>477</td>
<td>0</td>
<td>498</td>
<td>582</td>
</tr>
<tr>
<td>Spin</td>
<td>260</td>
<td>0</td>
<td>307</td>
<td>337</td>
</tr>
<tr>
<td>Skip</td>
<td>429</td>
<td>2</td>
<td>569</td>
<td>740</td>
</tr>
<tr>
<td>Lyft</td>
<td>238</td>
<td>2</td>
<td>302</td>
<td>443</td>
</tr>
</tbody>
</table>
Striking a balance between not knowing enough and knowing too much

Ms. Magrin's location data shows other often-visited locations, including the gym and Weight Watchers.
Regional dockless policy coordination

Metro, Portland, TriMet, Beaverton, Hillsboro, Gresham, Forest Grove, Tigard, Cornelius, Troutdale, WTA, PSU
State and federal policy

Avenues:
• Participating in State AV Task Force
• Advocacy on State ride-hailing policy
• Advocacy on Federal AV START Act

Priorities:
• Maintaining local authority
• Access to data
• Accountability and oversight
Who engaged with the program?

<table>
<thead>
<tr>
<th></th>
<th>LOIs</th>
<th>Applications</th>
<th>Awards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lead organizations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>14</td>
<td>Private 2</td>
<td>Non-profit 4</td>
</tr>
<tr>
<td>Public</td>
<td>8</td>
<td>Non-profit 7</td>
<td></td>
</tr>
<tr>
<td>Non-profit</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lead + partner organizations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>30</td>
<td>Private 12</td>
<td>Non-profit 7</td>
</tr>
<tr>
<td>Public</td>
<td>17</td>
<td>Public 4</td>
<td></td>
</tr>
<tr>
<td>Non-profit</td>
<td>21</td>
<td>Non-profit 13</td>
<td></td>
</tr>
</tbody>
</table>

LOIs: Letters of Intent, Applications: Application Submissions, Awards: Grant Awards
Technology changes everything! some things

↓ certainty about how people travel
↓ cost of trying something new
↓ transportation revenues
↑ importance of data
↑ role of private sector

Our goals don’t change.

Nor does the importance of infrastructure.
How would our residents commute if they didn’t have a car available?

Total: 16%
Low-income: 11%
2014 total: n/a

Total: 29%
Low-income: 42%
2014 total: 47%
## Roles and responsibilities

<table>
<thead>
<tr>
<th>Action</th>
<th>Cities &amp; counties</th>
<th>Transit agencies</th>
<th>Metro</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing plans</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Forecasting impacts</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Improving data</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Adopting AV policies</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Develop pricing</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Regulating new services</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Testing AVs</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Funding projects/pilots</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Convening &amp; education</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

✓ = lead
✓ = coordinate
Elements of seamless mobility

A rich variety of transportation options and infrastructure, available across the region

Data standards so that we can help people compare options and plan multimodal trips

Integrated payment that makes it convenient for people to pay fares

Public oversight so that we can ensure integration, consistency, and equitable access
## How are we doing on these elements?

<table>
<thead>
<tr>
<th>Mode</th>
<th>Regionally available?</th>
<th>Data standards?</th>
<th>Integrated w/ transit payment?</th>
<th>Public oversight?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driving</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Transit</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bike/walk</td>
<td>✓</td>
<td>✓</td>
<td>--</td>
<td>✓</td>
</tr>
<tr>
<td>Bike share</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Scooter share</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Ride-hailing</td>
<td>✓</td>
<td>X</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Car share</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Carpool</td>
<td>✓</td>
<td>X</td>
<td>X</td>
<td>✓</td>
</tr>
</tbody>
</table>

✓: All the way there   ❌: Not there
✓: Part of the way there  --: Not applicable
Meet the Speaker

Niloo is the Technical Program Manager at the Institute of Transportation Engineers. Niloo helps to manage the National Operations Center of Excellence technical services including webinar and peer exchange programs. In this dynamic role, she also facilitates the creation, coordination, and expansion of collaborative activities among transportation leaders, organizations and other key industry groups.
“Transferring knowledge about the TSMO practice around the country”
1. NOCoE Partners and Team
2. TSMO Awards
3. Research in Operations Database
4. Knowledge Transfer is Everyday
5. Workforce Development
6. Q&A
NOCoE Founding Partners

NOCoE Team

Patrick Son  
Managing Director

Sarah Abel  
Technical Program Manager

Niloo Parvinashtiani  
Technical Services Associate

Adam Hopps  
Communications and Program Manager

Thomas Kern  
Senior Consultant
2020 TSMO Awards

Overall Winner

GDOT
Georgia Department of Transportation

Georgia Wins for their Automated Traffic Signal Performance Measures Project
### 3rd Annual NOCoE TSMO Award Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Best TSMO Project</td>
<td>We want to hear about your newest project that demonstrates the value of TSMO.</td>
</tr>
<tr>
<td>2. Agency Improvement:</td>
<td>How did you use Capability Maturity Model Elements to improve your agency’s TSMO capabilities?</td>
</tr>
<tr>
<td>3. Work Zones Using TSMO</td>
<td>We want to hear about how TSMO enhanced your work zone management efforts to improve safety and mobility.</td>
</tr>
<tr>
<td>4. Project Selection and Prioritization for TSMO</td>
<td>How are you ensuring that TSMO is incorporated into your capital infrastructure/improvement projects process focusing on project selection and prioritization policies and business processes?</td>
</tr>
</tbody>
</table>
THE 2021 TSMO AWARD WINNERS HAVE BEEN ANNOUNCED!
Best TSMO Project: Pennsylvania DOT

PennDOT's real-time incident and congestion information allows for actionable decisions to keep their highways safer for the traveling public.

Case Study: TSMO Performance Program and Traffic Operations Analytics Tool
by Pennsylvania Department of Transportation

IN THIS CASE STUDY YOU WILL LEARN:

- How PennDOT used PennDOT's Crash Reporting System (CRS) and Road Condition Reporting System (RCRS), with a traffic speed probe data from INRIX, and crowd sourced incident data from Waze to help make TSMO decisions.
- How the data aggregation increased the accuracy of incident timeline milestones and allowed for adding a new measure to the traditional incident timeline, ‘incident influence time’ which is a measure of the duration it takes for the road to get back to normal operating condition after an incident occurs.
- How the application’s design has allowed for the creation of a “real time” incident timeline outlining incident congestion ebbs and flows.

Agency Improvement: North Carolina DOT

North Carolina DOT built a traffic incident management (TIM) training track to provide a lifelike classroom to increase incident response time, improve air quality, and help save the lives of responders.

Case Study: Traffic Incident Management (TIM) Training Track
by North Carolina Department of Transportation

IN THIS CASE STUDY YOU WILL LEARN:

- How traffic incident management (TIM) response training can be done safely in a test track facility
- How a test track can provide training in a multitude of physical features encountered in all three regions of the North Carolina: coastal, piedmont, and mountain, as well as incorporate a broad range of physical characteristics that allow agencies to practice various incident work zone applications and vehicle maneuvers
- How the test track education and training can reduce incidence clearance times.
Project Selection and Prioritization: Pennsylvania DOT

PennDOT's Regional Operations Plans initiated collaboration and long-term planning activities to improve the safety and mobility of their travelers.

Case Study: Regional Operations Plans
by Pennsylvania Department of Transportation

IN THIS CASE STUDY YOU WILL LEARN:

- How Regional Operations Plans were developed with cooperation with stakeholders including MPOs and RPOs, FHWA, PennDOT Central Office & District Planning & Programming staff, PennDOT District Safety, Design, and Construction Engineers, PennDOT County Maintenance Departments, the Pennsylvania Tumpike Commission, as well as local emergency responders, transit agencies, universities, and the local National Weather Service office.
- How the Regional Operations Plans play an important role in regional Long-Range Transportation Plan (LRTP) and Transportation Improvement Plan (TIP) processes by helping to secure future capital funding for projects incorporating TSMO solution
- How using a wide range of stakeholders for the Plans resulted in strong relationships with planning partners and buy-in and funding support.

Work Zones Using TSMO: Iowa DOT

Iowa DOT’s proactive work zone management strategies improve the safety of the traveler and reduce the effects of delays from work zones.

Case Study: Comprehensive Work Zone Program
by Iowa Department of Transportation

IN THIS CASE STUDY YOU WILL LEARN:

- How Iowa DOT developed a detailed, five-year Work Zone Management Service Layer Plan to clarify the tactical areas in which the Department should apply its limited time and resources.
- How the plan incorporates resources for determining Traffic Critical Projects (TCP) and provide resources for mitigation countermeasures that integrated into the project Design Manual
THE WINNER OF THE 2021 TSMO AWARD FOR BEST TSMO PROJECT IS PENNSYLVANIA DOT
Research in Operations Database

[https://research.transportationops.org/](https://research.transportationops.org/)

<table>
<thead>
<tr>
<th>Date</th>
<th>Focus Area</th>
<th>Idea</th>
<th>Rating</th>
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<tr>
<td>08/06/2020</td>
<td>ITS Technologies</td>
<td>Machine Vision Interface with Light Emitting Diode (LED) Traffic Control Device Displays</td>
<td>★★★★★</td>
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<td>Transportation Systems Management &amp; Operations</td>
<td>Use of Cloud and Software as a Service for Traffic Management Systems</td>
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<td>Freight/Commercial Vehicle Management and Operations</td>
<td>Permit Violations - Hauling permits</td>
<td>★★★★★</td>
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<td>Emergency Management/Transportation Security</td>
<td>COMMUNICATING POLICE DIRECTIVES TO AUTONOMOUS VEHICLES: PROOF-OF-CONCEPT AND FULL-Demonstration</td>
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<td>Traffic Analysis and Management Tools</td>
<td>Quantifying the Safety Effects of Driver Assistive Systems</td>
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We aim to transfer TSMO knowledge every day.
Commit to identifying how to transfer knowledge:

• In Your Department
• Across Departments
• Across the Industry
The TSMO Workforce Development Guidebook
(What it is and what it is not)

GOAL
Assist you in creating meaningful TSMO-related positions that will help advance your organization’s maturity
So where do I find?

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

https://transportationops.org/workforce
What are the positions?

- 19 different positions descriptions created
  - Pick and choose list
  - “starter list”
- 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
- Use positions descriptions as starting point – Modify to fit your needs
Capability Maturity Model
Improvement Potential

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

Improvement Potential

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

Area of Improvement: Management Operations

Legend
Area of Improvement
Collaboration
Business Processes
Organization/Staffing
Systems & Technology
Culture
Performance Measurement

CMM Levels 1-2
- Computer Engineer
- Systems Engineer
- Telecom. Engineer
- TIM Program Manager
- TMC Manager

CMM Levels 2-3
- 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

CMM Levels 3-4
- Artificial Intelligence Scientist
- Surface Weather Specialist
- TSMO Manager/Chief/Bureau Director
Engage Us: Online or Social

Niloo Parvinashtiani, P.E.,
Technical Program Manager
zparvin@transportationops.org

www.transportationops.org
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Thank you for joining us!

It’s not too late to sign up for the Emerging Technologies Working Group! Visit https://ampo.org/working-groups/working-group-application to join today!