



Building Technical Capacity

Emerging Technologies Working Group
Webinar 1

Thursday, March 11, 2021

2:00 PM ET

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

Today's Moderator



Eric Hill
Metroplan Orlando
Working Group Leadership

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

Introduction

- Bob McQueen
- Presentation Objectives

1

Smart cities

- Definition
- Services

2

Mobility

- Revolution
- Consequences
- Completeness

3

Emerging

- Automated driving systems
- Mobility as a Service
- Blockchain
- Urban Air Mobility

4

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

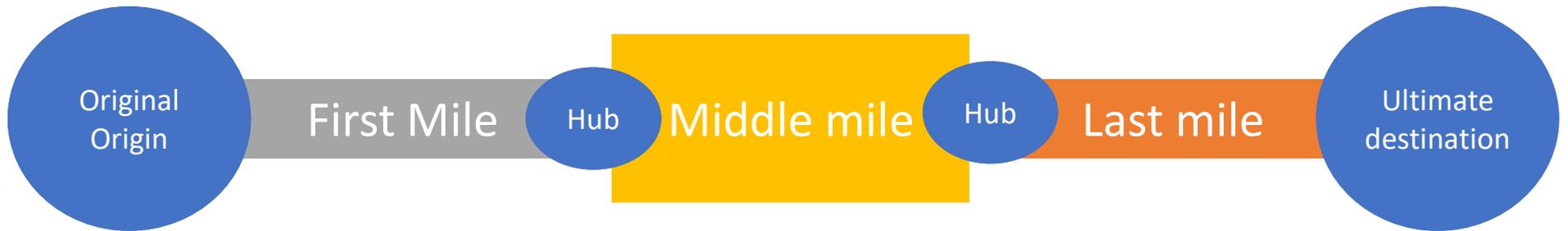
Public

- 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

- Clear understanding of problems and needs
- Effective dialogue with the public sector
- Detailed understanding of new business models

Private

Complete: across transportation



Planning 01

- 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 02

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

Delivery 03

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

Operations 04

- 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 05

- 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

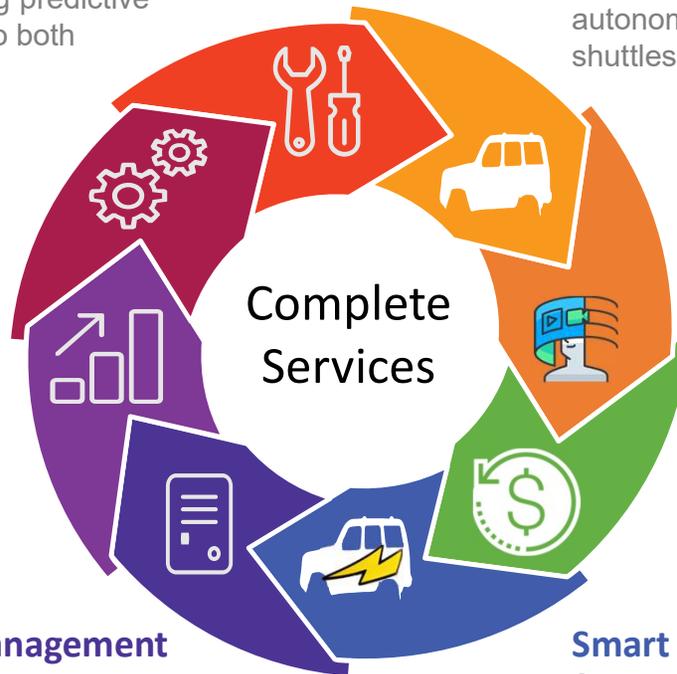
A range of services that do not provide direct benefit but provide enabling support for the other services

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

Adapt

Develop flexible and adaptable infrastructure and management systems that conforms to demand changes

Advise

Provide regional travelers with decision quality information in the right place at the right time

Align

Public-public and public-private partnerships that are equitable and sustainable. Organizational alignment to goals

Connect

transport as a single system, with appropriate interconnections and service synchronization.

Guide

Develop informed policies that achieve results and harness private sector innovation. Based on observed data and analytics

KnownGo

Mobility as a service to enable travelers to make the best decisions and discover the best way to get there

Moneywise

Results driven investments that integrate infrastructure, technology and services

People 1st

Understanding and providing for the needs of citizens and the evolving workforce

Powerflex

Clean flexible energy, environmental preservation, fuel efficient regional transport

Sentient

Managing growth to achieve balanced objectives by applying knowledge and wisdom

Tapestry

Interwoven technologies that align with infrastructure and services to reinforce each other

Worksmart

Incorporation of best practices and lessons learned nationally and internationally

Emerging technologies: Automated driving systems

| Society of Automotive Engineers (SAE) Automation Levels | | | | | |
|---|--|---|--|---|---|
|  |  |  |  |  |  |
| 0 | 1 | 2 | 3 | 4 | 5 |
| NO AUTOMATION | DRIVER ASSISTANCE | PARTIAL AUTOMATION | CONDITIONAL AUTOMATION | HIGH AUTOMATION | FULL AUTOMATION |
| Zero autonomy, the driver performs all driving tasks. | Vehicle is controlled by the driver, but some driving assist features may be included in the vehicle design. | Vehicle has combined automated functionalities like acceleration and steering, but the driver must remain engaged with the driving task and monitor the environment at all times. | Driver is a necessity, but is not required to monitor the environment. The driver must be ready to take control of the vehicle at all times with notice. | The vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle. | The vehicle is capable of performing all driving functions under all conditions. The driver may have the option to control the vehicle. |



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



block

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- Transaction occurs
- All parties agree on details
- Encoded into a block of digital data
- With unique signature or identifier

block

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- Blocks are connected by links
- Links are derived from the data inside each block
- Using a hash function

block

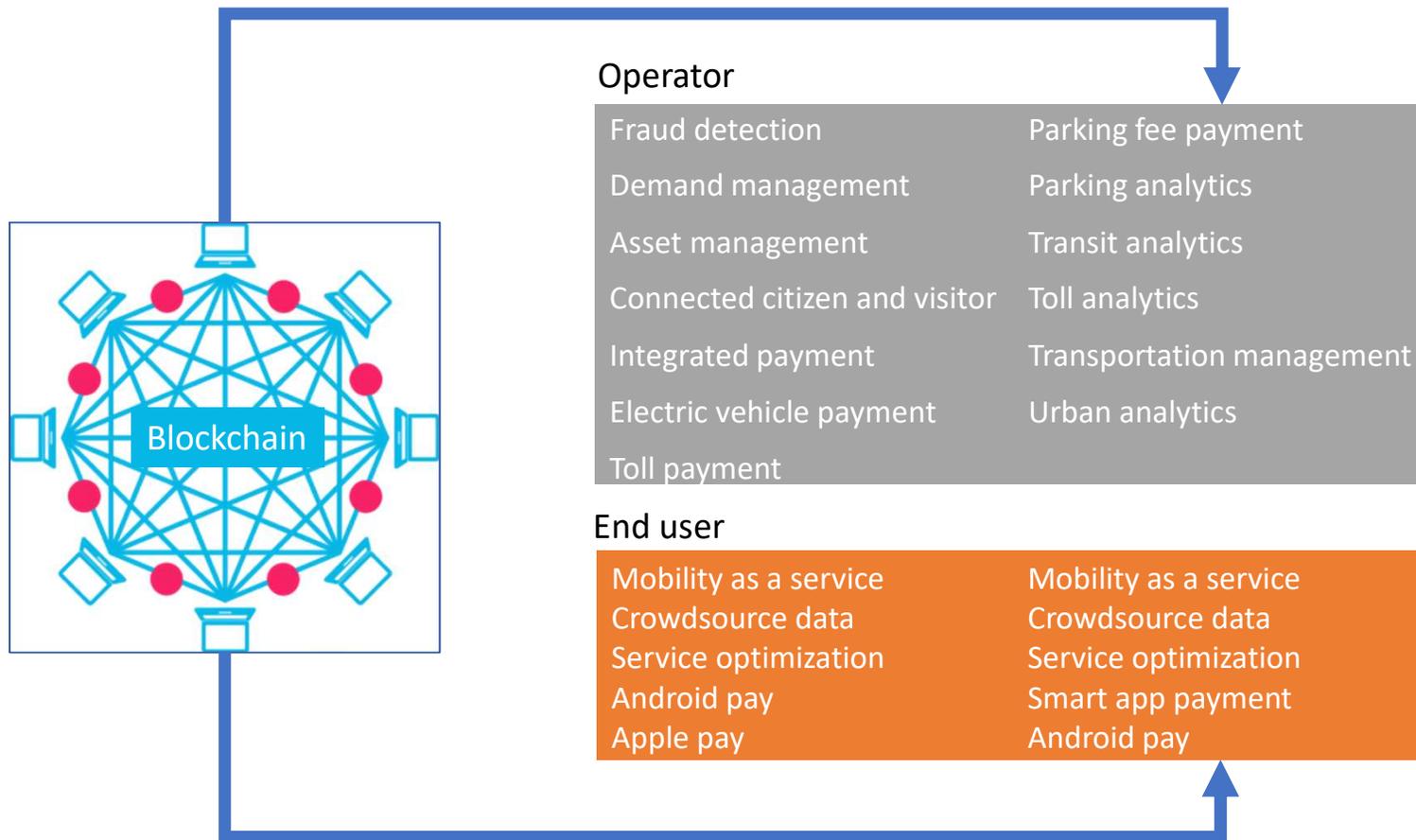
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- Blocks are chained together
- Data in the block is tamper evident
- Changes in the sequence of blocks this tamper evident
- Clearly visible effect of any changes made

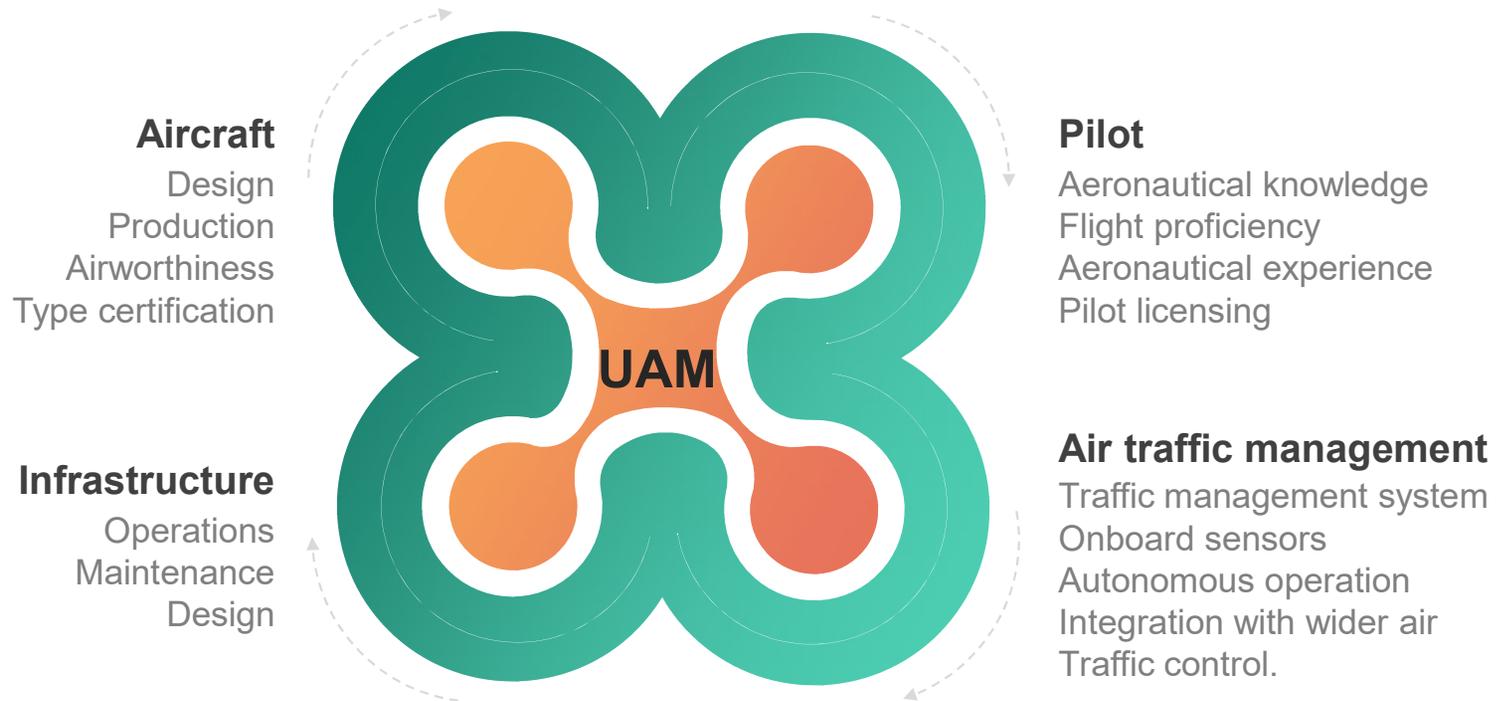
"The blockchain is an incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value."

Don & Alex Tapscott, authors
 Blockchain Revolution (2016)

Block chain use cases



Emerging technologies: Urban Air Mobility



Urban Air Mobility (UAM)



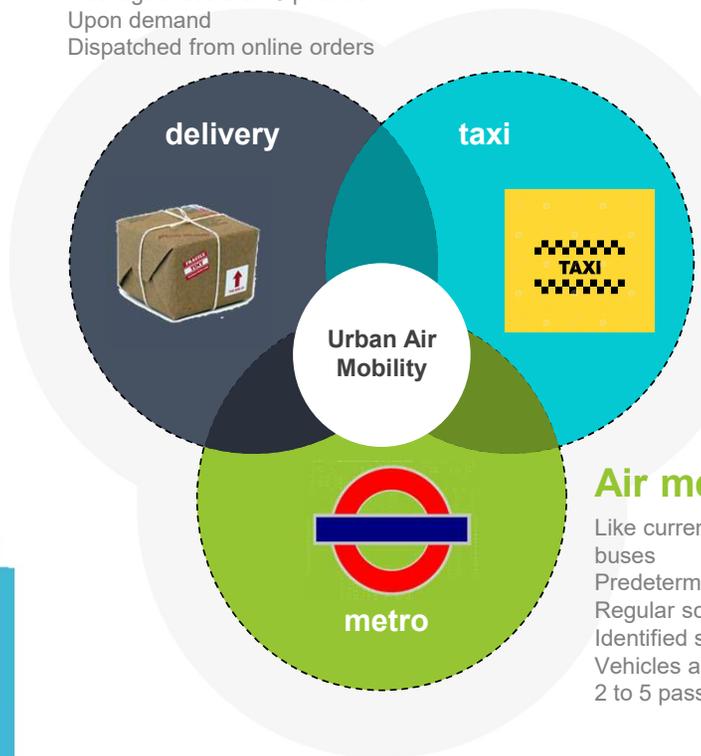
- Automated or manual pilot
- Less than 55lbs
- More than 55lbs
- Electric
- Vertical take off and landing
- Range: 60 to 300 mile
- Altitude: 400 to 2000 f
- Passenger or goods



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

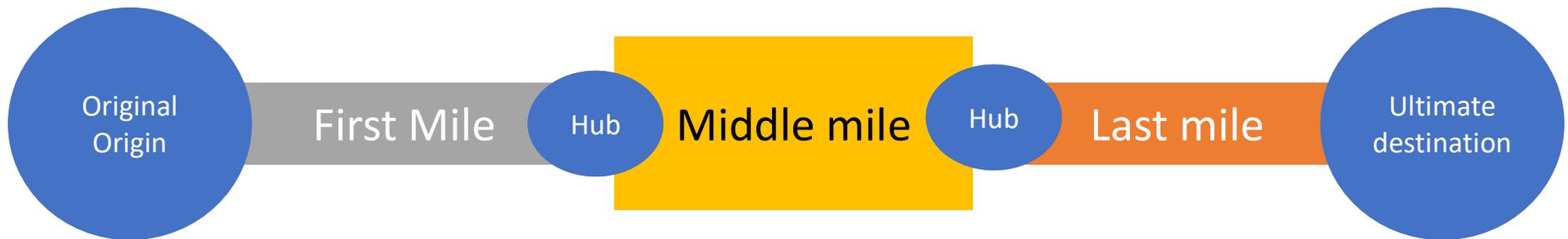
Air metro

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

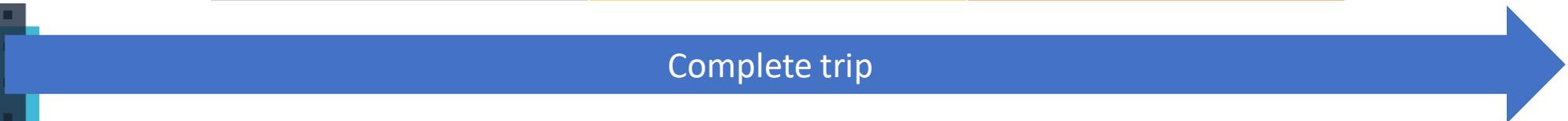
Challenges

- Certification
- Integration with existing transportation
- Public acceptance
- Public and private sector working together
- Organizational capabilities

Opportunities



| 1st mile | Middle mile | Last mile |
|------------------|-------------|-----------|
| Private car | Airplane | Rideshare |
| Electric scooter | Bus | walk |
| walk | Hyperloop | Walk |
| Rideshare | Air metro | Rideshare |
| Bicycle | Air taxi | Taxi |



Summary

Introduction

- Bob McQueen
- Presentation Objectives

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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

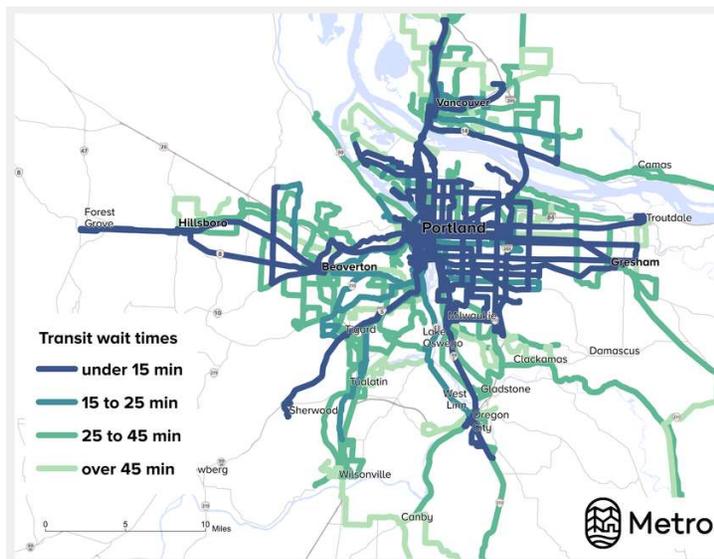
AMPO

March 11, 2018

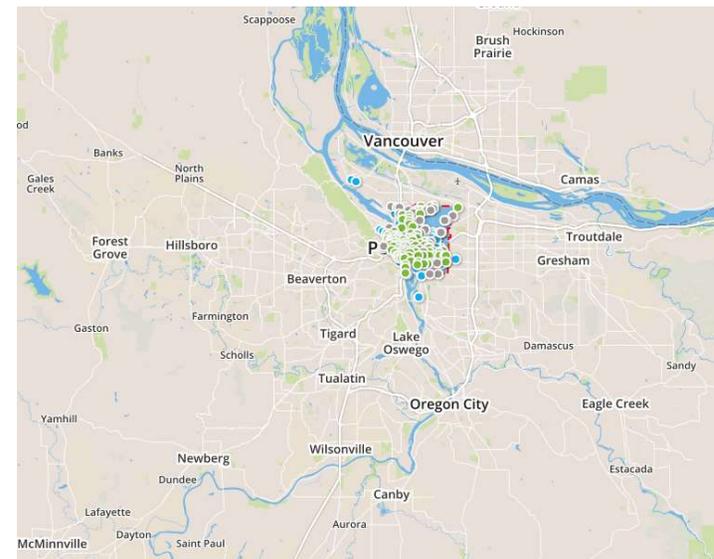
Transportation habits are changing fast

| | 2019 | 2014 |
|--|---------|-------|
| Uber/Lyft trips | 12m | 0 |
| Bikeshare trips | 400k | 0 |
| Scooter trips | 700k | 0 |
| Shared cars | >1,000* | <100 |
| Rank of smartphones as a source of travel info | #1 | #3 |
| Weekly bus trips | 1.05m | 1.15m |

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



Choices

Equity

Information

Innovation

- Understand today to shape tomorrow
- Acknowledge uncertainty
- Embrace “speedy incrementalism”
- Work at the intersection of technological innovation and community innovation

What's Metro doing?



PUBLIC REVIEW DRAFT
**2018 Regional
Transportation Plan**
*A blueprint for the future of transportation
in the greater Portland region*
June 29, 2018 oregonmetro.gov/rtp

Plan the
transportation
system to meet
regional goals



PUBLIC REVIEW DRAFT
2018 Regional Transportation Plan
**Emerging Technology
Strategy**
*A strategy for guiding innovation to support
the greater Portland region's goals*
June 25 2018 oregonmetro.gov/rtp

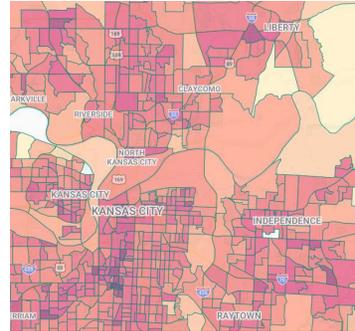
Guide innovation and
to advance equity
and improve travel
options

**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

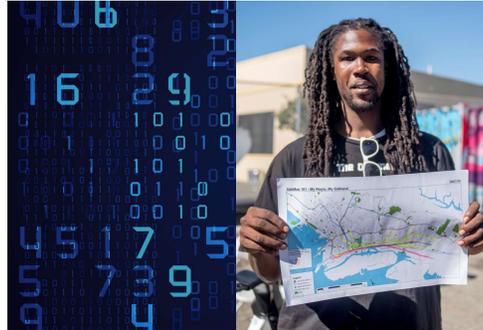


**State and federal
policy advocacy** to
maintain local and
regional authority
to do what's best
for the public

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

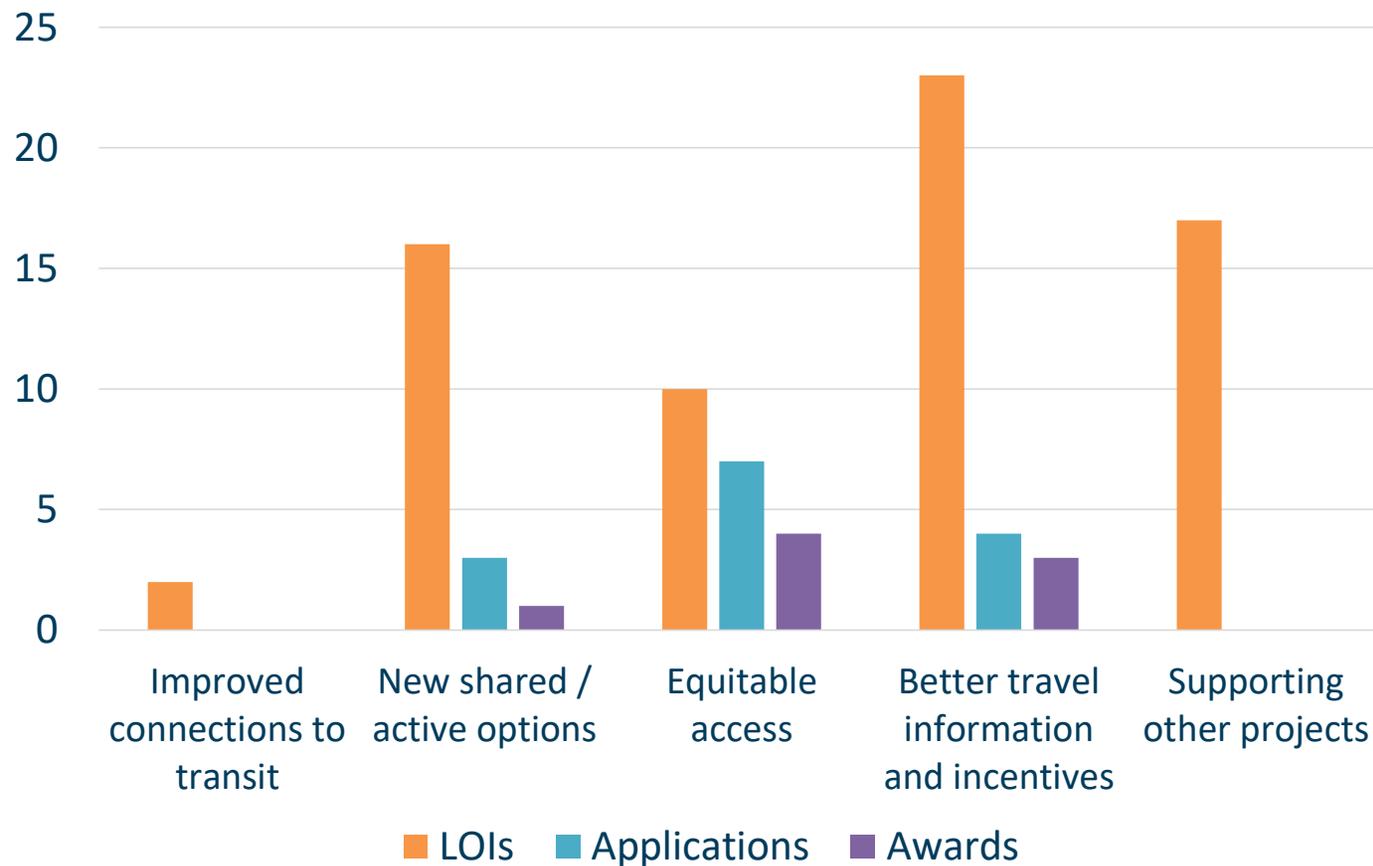


Goal 3: Develop partnerships across sectors that lay the groundwork for future success

2019 PILOT projects

| Project partners | Project name / description | Grant amount |
|---|--|--------------|
| APANO, ROSE CDC, PBOT, various companies | New Mobility at the Orchards of 82 nd : 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. | \$30,000 |
| Latino Network, Uber, TriMet | Latinx Ride Share Promotion: Provide ride-hailing credits and travel assistance to help Latinxs reach educational programs and services at locations throughout the region | \$55,000 |
| OPAL, Portland Transport, Rosewood Initiative | 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 | \$30,000 |
| Ride Connection, Full Path, Trillium Transit | Trip Planning for All: Develop a trip planning tool that provides information on demand-response / special needs transportation services in the region | \$35,000 |

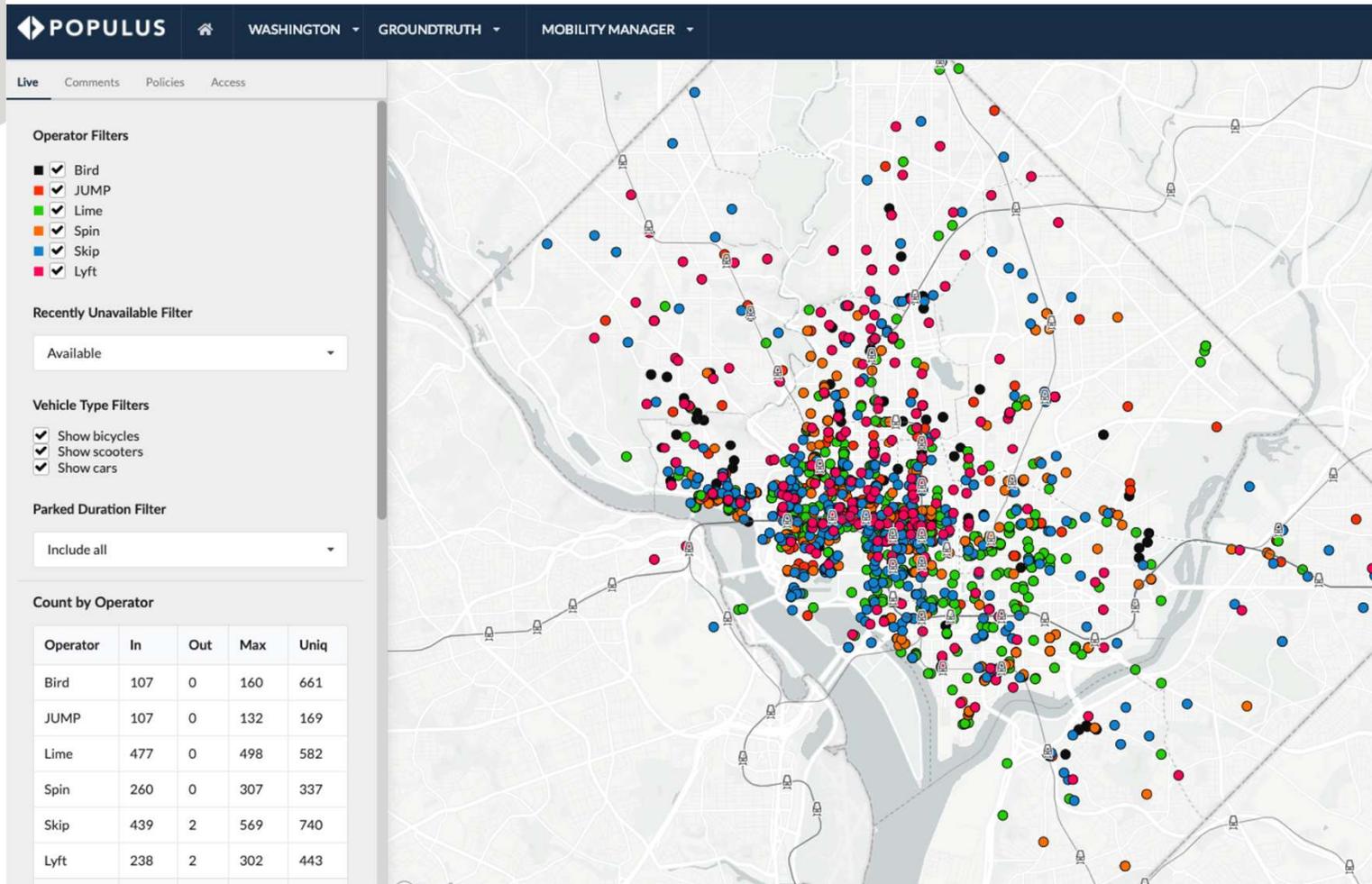
What outcomes can we achieve through this approach?



Did we meet our goals?

| Goal | Successes | Opportunities to improve |
|---|---|--|
| Advance equity and transportation choices | Equity | Choices |
| Form partnerships | Non-profit / private | Public agency partners |
| Support work across the region | 2 regional projects | No local projects outside of Portland |
| Leverage resources | \$95K in match | Aligning with partner projects, reducing partnership risks |
| Engaging / equitable process | Formed new partnerships and fostered engagement | Hard to understand what Metro wants |
| | | |

Data: regional micromobility dashboard

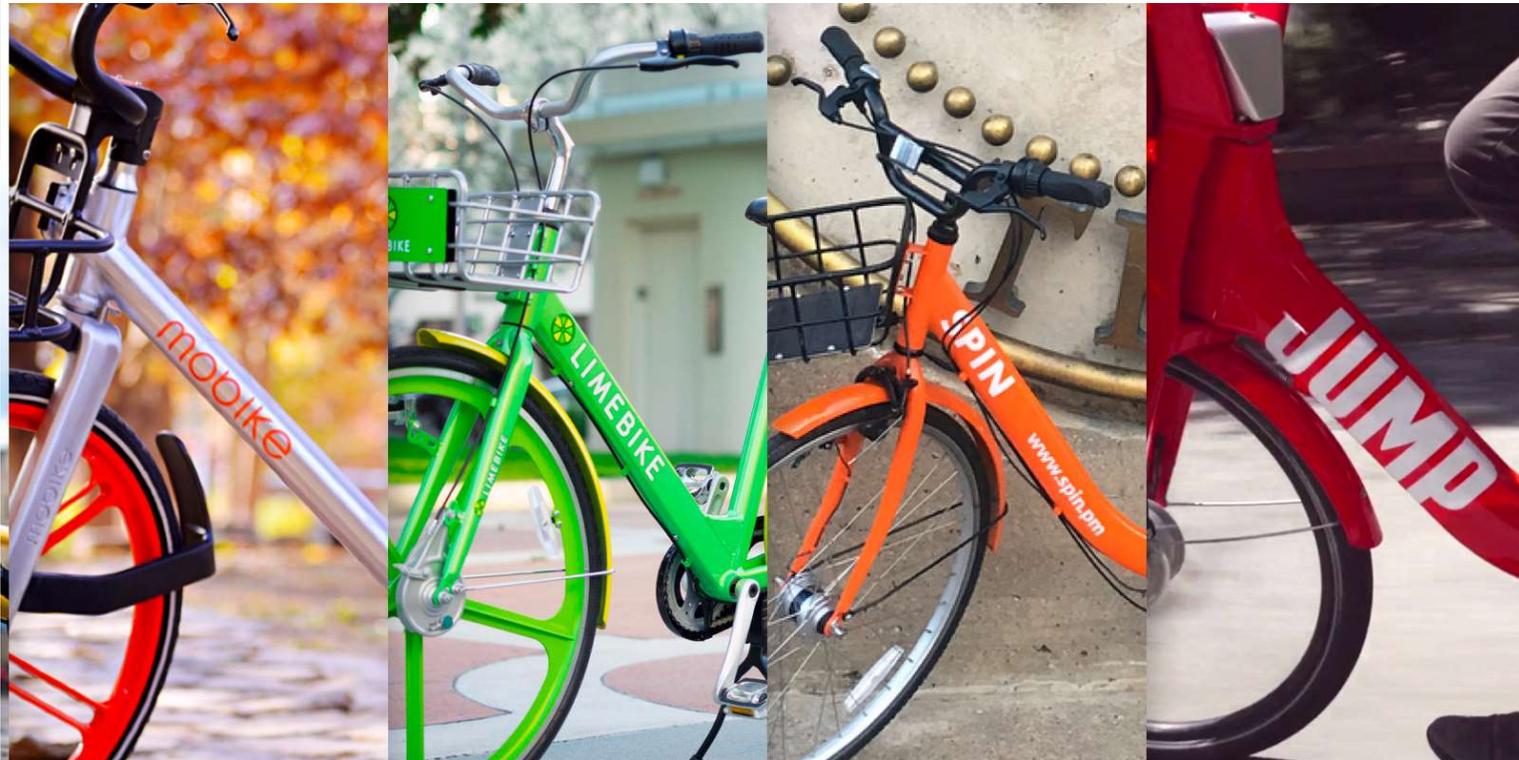




Ms. Magrin's location data shows other often-visited locations, including the gym and Weight Watchers.

Striking a balance between not knowing enough and knowing too much

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

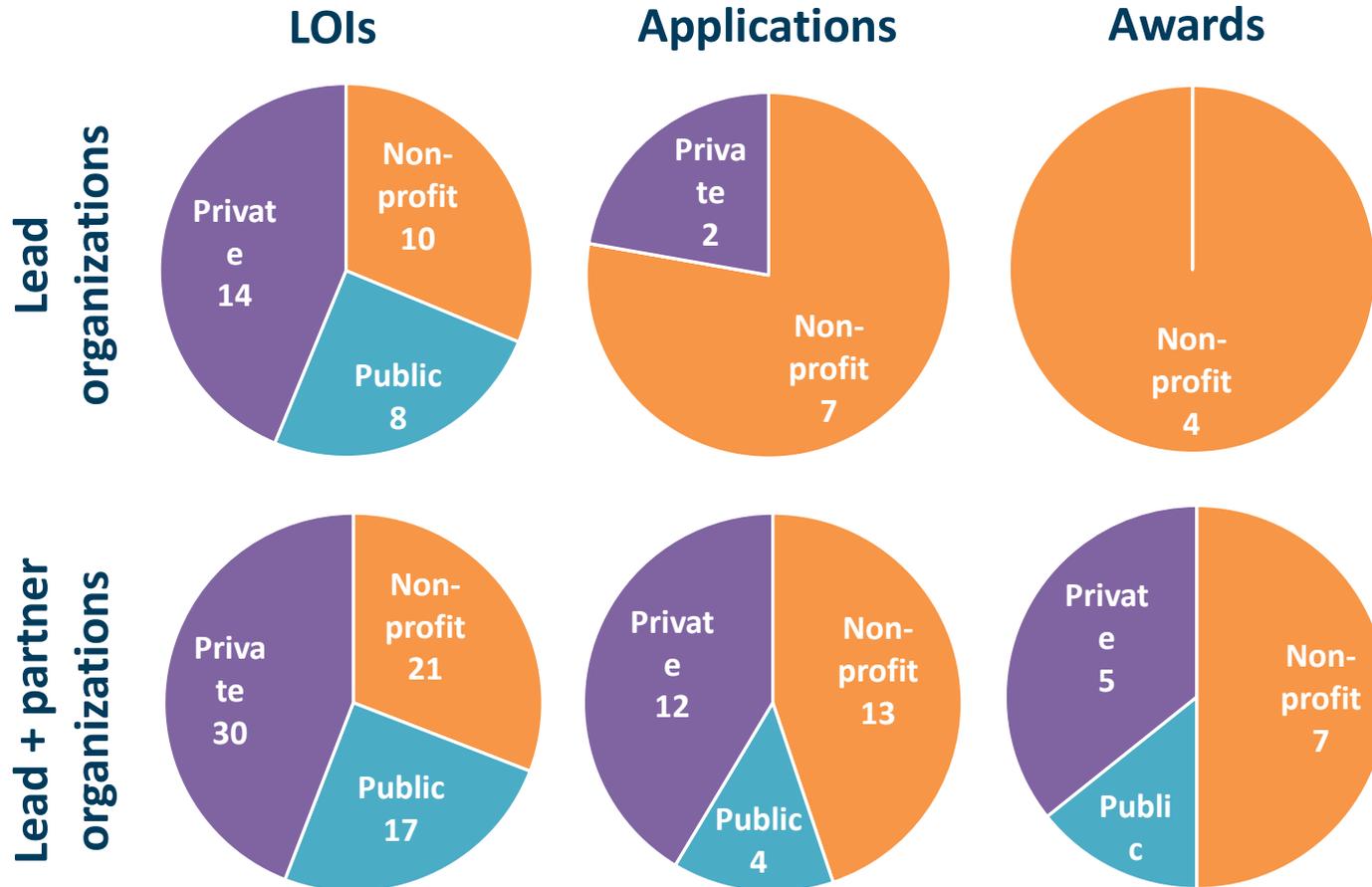
Priorities:

- Maintaining local authority
- Access to data
- Accountability and oversight

oregonmetro.gov/rtp
oregonmetro.gov/pilotgrants
eliot.rose@oregonmetro.gov



Who engaged with the program?



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

| Action | Cities & counties | Transit agencies | Metro | State |
|-------------------------|-------------------|------------------|-------|-------|
| Developing plans | ✓ | ✓ | ✓ | ✓ |
| Forecasting impacts | | | ✓ | ✓ |
| Improving data | ✓ | ✓ | ✓ | ✓ |
| Adopting AV policies | ✓ | | | ✓ |
| Develop pricing | ✓ | | ✓ | ✓ |
| Regulating new services | ✓ | | ✓ | ✓ |
| Testing AVs | ✓ | ✓ | | ✓ |
| Funding projects/pilots | ✓ | ✓ | ✓ | |
| Convening & education | ✓ | | ✓ | |

✓ = 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?

| Mode | Regionally available? | Data standards? | Integrated w/ transit payment? | Public oversight? |
|---------------|-----------------------|-----------------|--------------------------------|-------------------|
| Driving | ✓ | ✓ | X | ✓ |
| Transit | ✓ | ✓ | ✓ | ✓ |
| Bike/walk | ✓ | ✓ | -- | ✓ |
| Bike share | ✓ | ✓ | ✓ | ✓ |
| Scooter share | ✓ | ✓ | X | ✓ |
| Ride-hailing | ✓ | X | X | ✓ |
| Car share | ✓ | X | ✓ | ✓ |
| Carpool | ✓ | X | X | ✓ |

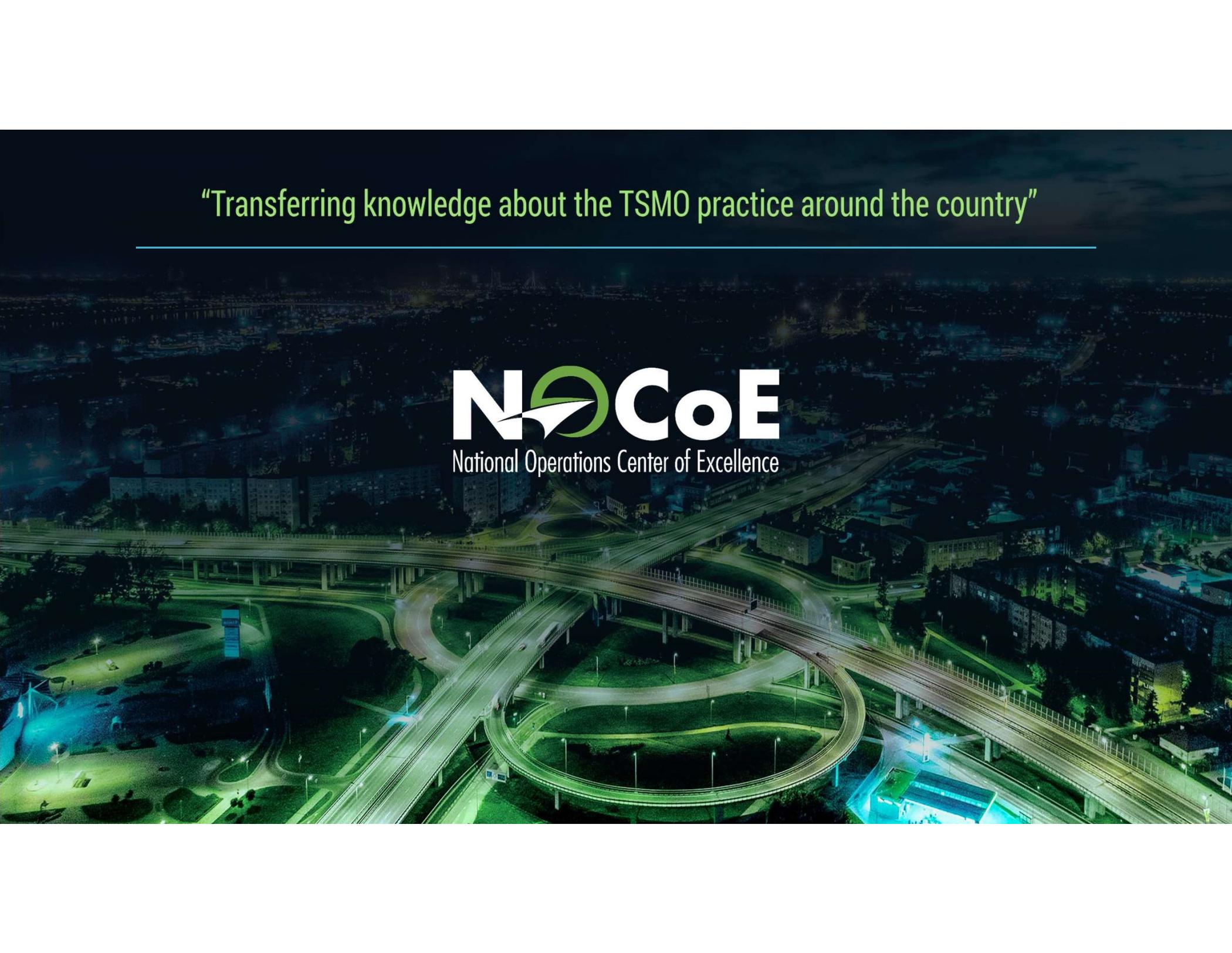
- ✓ : All the way there
- ✓ : Part of the way there
- X : Not there
- : Not applicable

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”



NCoE
National Operations Center of Excellence

PRESENTATION OUTLINE

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



Georgia Wins for their Automated Traffic Signal Performance Measures Project



TSMO CHAMPION



Tony Kratofil, P.E.
Chief Operating Officer
and Chief Engineer
Michigan Department of
Transportation

BIOGRAPHY FOR TONY KRATOFIL

Tony Kratofil was appointed Chief Operating Officer and Chief Engineer for the Michigan Department of Transportation in August 2018. As a member of the Director's Executive Team, he provides leadership and support for planning, organizing, operating, and maintaining all aspects of a comprehensive integrated surface transit system that is responsive to the current and future needs of Michigan's citizens. Mr. Kratofil has been with MDT for over 20 years.

As Michigan's first Region Program Mgr., Kratofil led numerous initiatives to increase mobility and safety in the region while addressing connectivity, the construction of major infrastructure and performance while managing a budget of billions and working extensively with the City of Detroit and other partners related to the state's most international design. Additionally, his knowledge and strong relationships helped negotiate and implement benefits, community access, transit, property, transit, and air quality, housing, and other transportation-related projects across the state. Through his leadership, the proposed 30-year transit will be delivered to the state and include a Michigan that addresses all transportation-related and safety delivery needs.

Mr. Kratofil has been an advocate for encouraging inclusion and diversity in the transportation industry and MDT's projects and programs. In 2016, he launched the Partnership for Excellence in Transportation, an initiative to bring together stakeholders from across state sectors to explore ways to



Faisal Saleem
ITS Branch Manager & MCDOT
SMARTdrive Program Manager

BIOGRAPHY FOR FAISAL SALEEM

Faisal Saleem has worked MCDOT for nearly 20 years as the ITS Branch Manager, the MCDOT SMARTdrive Program Manager and the MCDOT Traffic of Lead. He has worked on several leading MCDOT and ITS (in regional ITS) projects and processes, including the integration of TSMO strategies and delivery of projects from concept to delivery and operation.

Faisal Saleem has indicated his career in advancing TSMO through Intelligent Transportation Systems (ITS) strategies and a variety of projects, including and efficiency. He is committed to providing the best possible service to our customers, his colleagues and the state of Michigan. He has the resources and technology to deliver TSMO solutions on the regional level. He is committed to the advancement of TSMO through technology, education and the continuing integration of TSMO strategies and solutions.



Maricopa County
Department of Transportation

Faisal Saleem has been instrumental in the development of many projects to increase traffic efficiency, not only in county roads, but in connecting with multiple jurisdictions through the Phoenix Metropolitan Area.



3rd Annual NOCoE TSMO Award Categories

1. Best TSMO Project

We want to hear about your newest project that demonstrates the value of TSMO

2. Agency Improvement:

How did you use Capability Maturity Model Elements to improve your agency's TSMO capabilities?

3. Work Zones Using TSMO

We want to hear about how TSMO enhanced your work zone management efforts to improve safety and mobility.

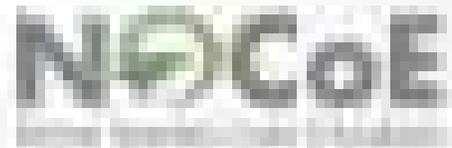
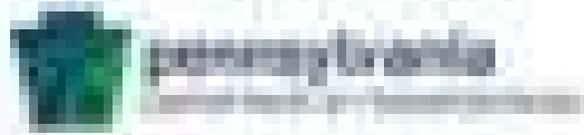
4. Project Selection and Prioritization for TSMO

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?



THE 2021 TSMO AWARD WINNERS HAVE BEEN ANNOUNCED!

THE WINNER OF THE 2021 TSMO AWARD FOR BEST TSMO PROJECT IS PENNSYLVANIA DOT



Research in Operations Database

<https://research.transportationops.org/>

| Created | Focus Area | Idea | Rating | Status |
|------------|--|---|--------|------------|
| 08/06/2020 | ITS Technologies | Machine Vision Interface with Light Emitting Diode (LED) Traffic Control Device Displays | ★★★★★ | Not Funded |
| 08/04/2020 | Transportation Systems Management & Operations | Use of Cloud and Software as a Service for Traffic Management Systems | ★★★★★ | Not Funded |
| 08/04/2020 | Transportation Systems Management & Operations | Applying Artificial Intelligence and Machine Learning Advances for Freeway Operations | ★★★★★ | Not Funded |
| 07/31/2020 | Freight/Commercial Vehicle Management and Operations | Permit Violations -Hauling permits | ★★★★★ | Not Funded |
| 07/31/2020 | Freight/Commercial Vehicle Management and Operations | Interstate Information Sharing of State Truck Regulatory Requirements | ★★★★★ | Not Funded |
| 07/31/2020 | ITS Technologies | Personal Protective Equipment for Individuals Working with Automated Vehicle Systems | ★★★★★ | Not Funded |
| 07/31/2020 | Emergency Management/Transportation Security | COMMUNICATING POLICE DIRECTIVES TO AUTONOMOUS VEHICLES: PROOF-OF-CONCEPT AND FULL- DEMONSTRATION | ★★★★★ | Not Funded |
| 07/30/2020 | Traffic Analysis and Management Tools | Quantifying the Safety Effects of Driver Assistive Systems | ★★★★★ | Not Funded |
| 07/29/2020 | ITS Technologies | Traffic Sensor Testing Methodology and Evaluation Program | ★★★★★ | Not Funded |
| 07/24/2020 | Transportation Systems Management & Operations | Evaluating the Impacts of Real-Time Warnings and Variable Speed Limits on Safety and Travel Reliability during Weather Events | ★★★★★ | Not Funded |
| 07/22/2020 | Freight/Commercial Vehicle Management and Operations | State Harmonization of Trucking Requirements | ★★★★★ | Not Funded |

We aim to transfer TSMO knowledge every day.



Transfer Knowledge Everyday

Commit to identifying how to transfer knowledge:

- **In Your Department**
- **Across Departments**
- **Across the Industry**

24/7/365 DIGITAL LIBRARY

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

[NOCoE
Website](#)

Developing a
TSMO Workforce

TSMO Workforce
Retention

<https://transportationops.org/workforce>

What are the positions?



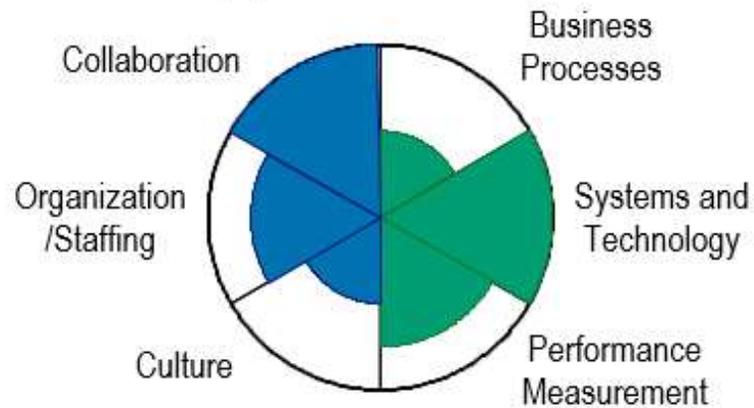
- 19 different positions descriptions created
 - Pick and choose list
 - “starter list”
- Some exist, but not widespread or can be expected to exist in future
- Developed to include:
 - When position might be needed – “Triggers”
 - How it relates to CMM improvement
 - Knowledge, Skills Abilities for position
- Use positions descriptions as starting point –
Modify to fit your needs

Capability Maturity Model Improvement Potential

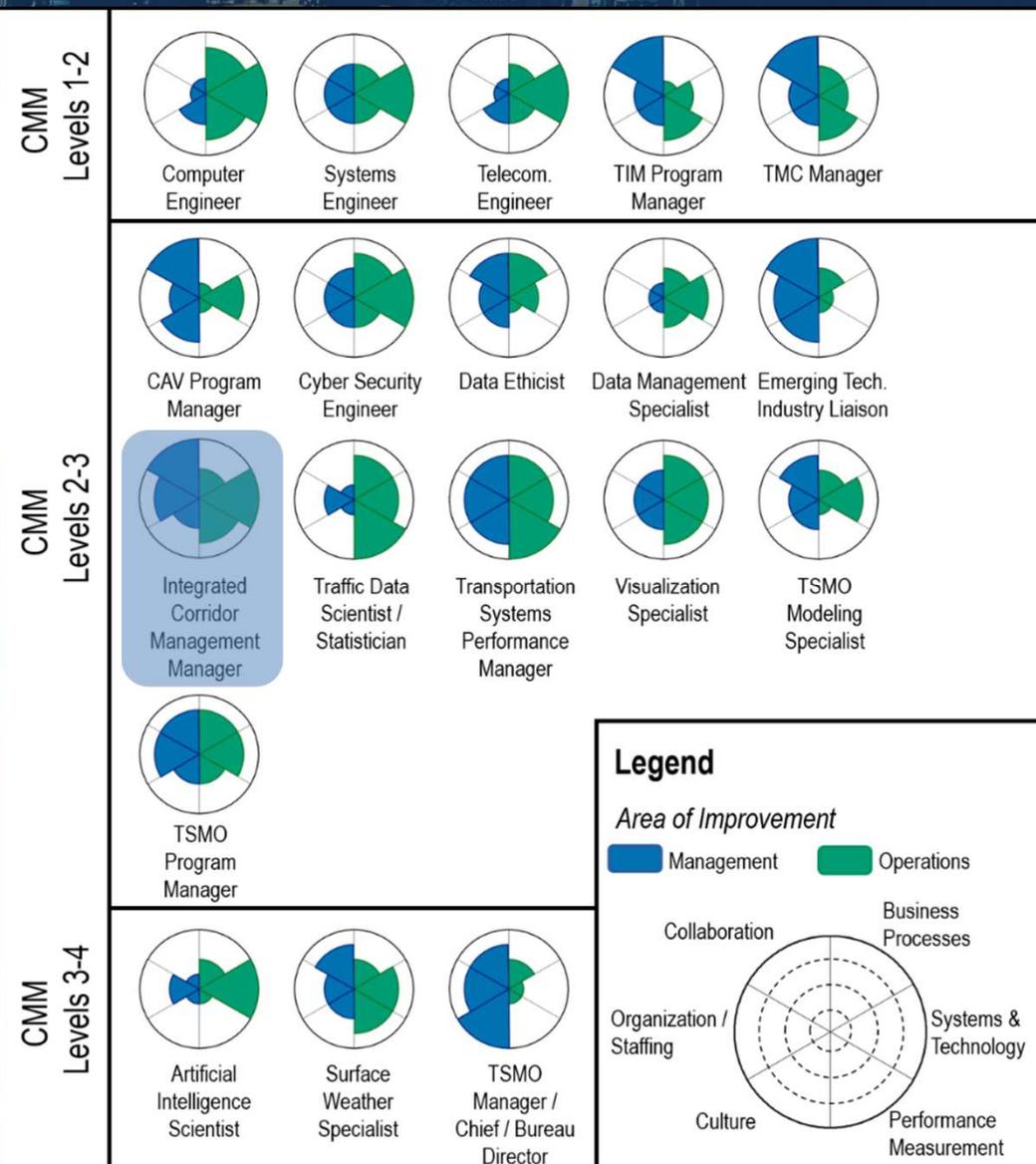
Integrated Corridor Management Manager

Typical TSMO Program CMM Level: 2-3

Improvement Potential



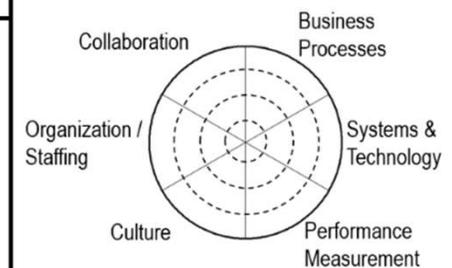
Area of Improvement: ■ Management ■ Operations



Legend

Area of Improvement

■ Management ■ Operations



Engage Us: Online or Social

Niloo Parvinashtiani, P.E.,
Technical Program Manager

zparvin@transportationops.org



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Questions & Answers

Please submit your questions via the question box

Bob McQueen: bob@bobmcqueenandassociates.com

Eliot Rose: Eliot.Rose@oregonmetro.gov

Niloo Parvinashtiani: azparvin@transportationops.org

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!