



TSMO Workforce Development: Preparing the Next Generation

TSITE Winter Meeting
February 25, 2021

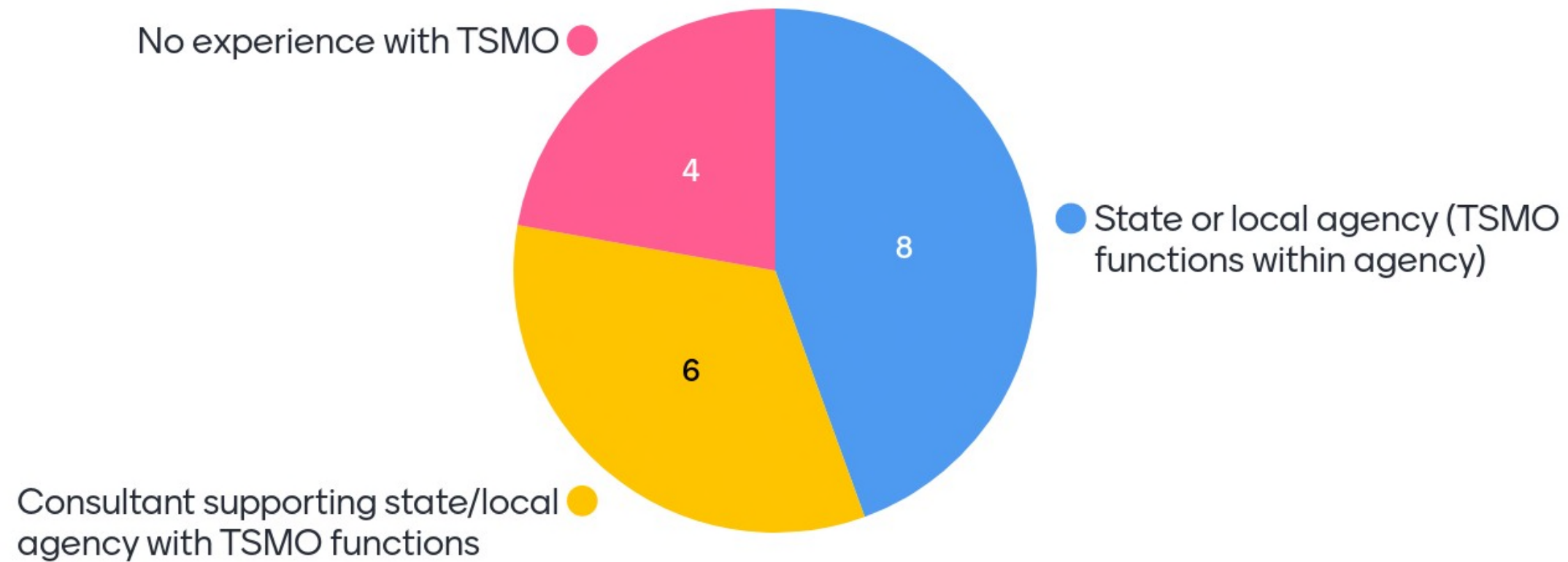
Stephanie S. Ivey
Director, Southeast Transportation Workforce Center

Agenda

- Recently completed research/resources
- TSMO workforce of the future
- What's up next for SETWC (and how to get involved!)



What type of experience do you have with TSMO?



Recent Research

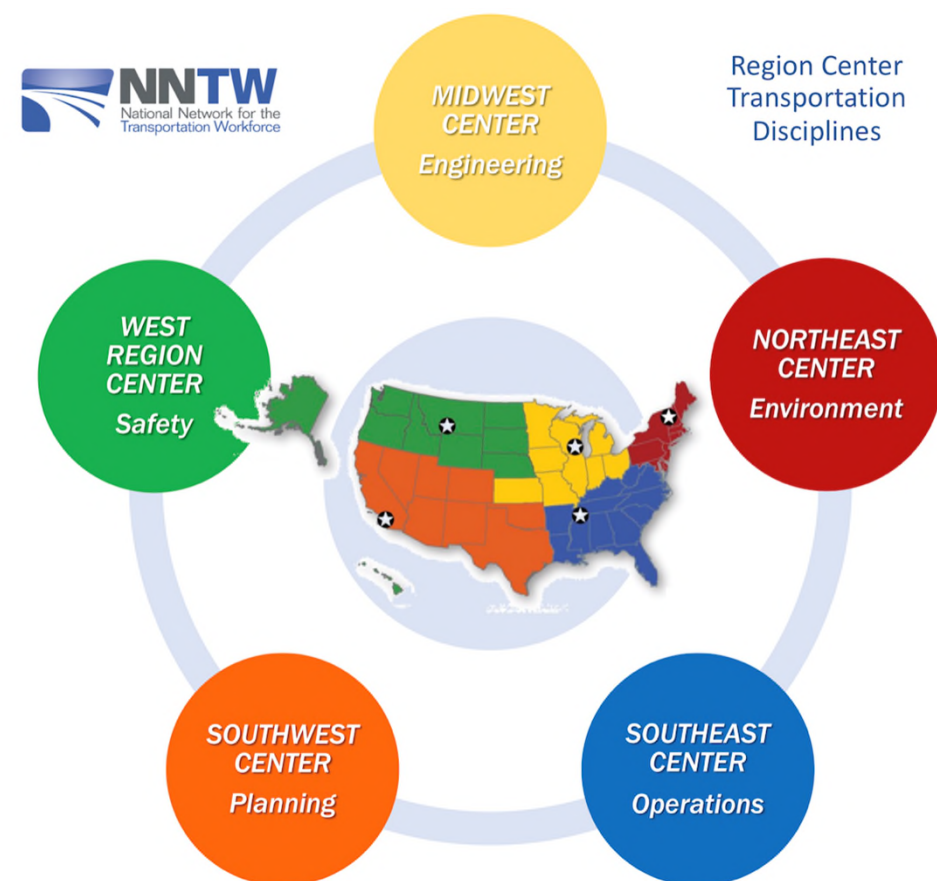
- **FHWA National Transportation Career Pathways Initiative (NTCPI)**
- **Empowering the New Mobility Workforce: Educating, Training, and Inspiring Future Transportation Professionals – Ed. Tyler Reeb, Elsevier 2019**
- **SETWC Playbooks:**
 - **Women in Transportation**
 - **T-STEM Academy**
- **TSMO Workforce Guidebook (*transportationops.org*)**



National Transportation Career Pathways Initiative - NTCPI



- <https://www.nntw.org/workforce-initiatives/ntcpi/>



- Priority occupation analysis
- Development of resources:
 - Competency models
 - Discipline model
 - Sample KSAs and job descriptions
 - Career pathway models
 - Programs of study
 - Experiential learning resources

NTCPI - Transportation Operations Career Clusters



Operations Management

- Project & Program Mgr¹
- Computer & Information Systems Manager
- Traffic Incident Manager
- Operations Planner

Systems/Operations Engineering

- Civil (Traffic) Engineer
- Civil (Transit) Engineer
- Industrial Engineer²

Operations Research & Data Science

- Operations Research Analyst/Industrial Eng.²
- Data Science Analyst/Logistician

Operations Technology

- Traffic Signal Technicians
- Diesel Mechanics
- Commercial Drivers



Transportation Operations

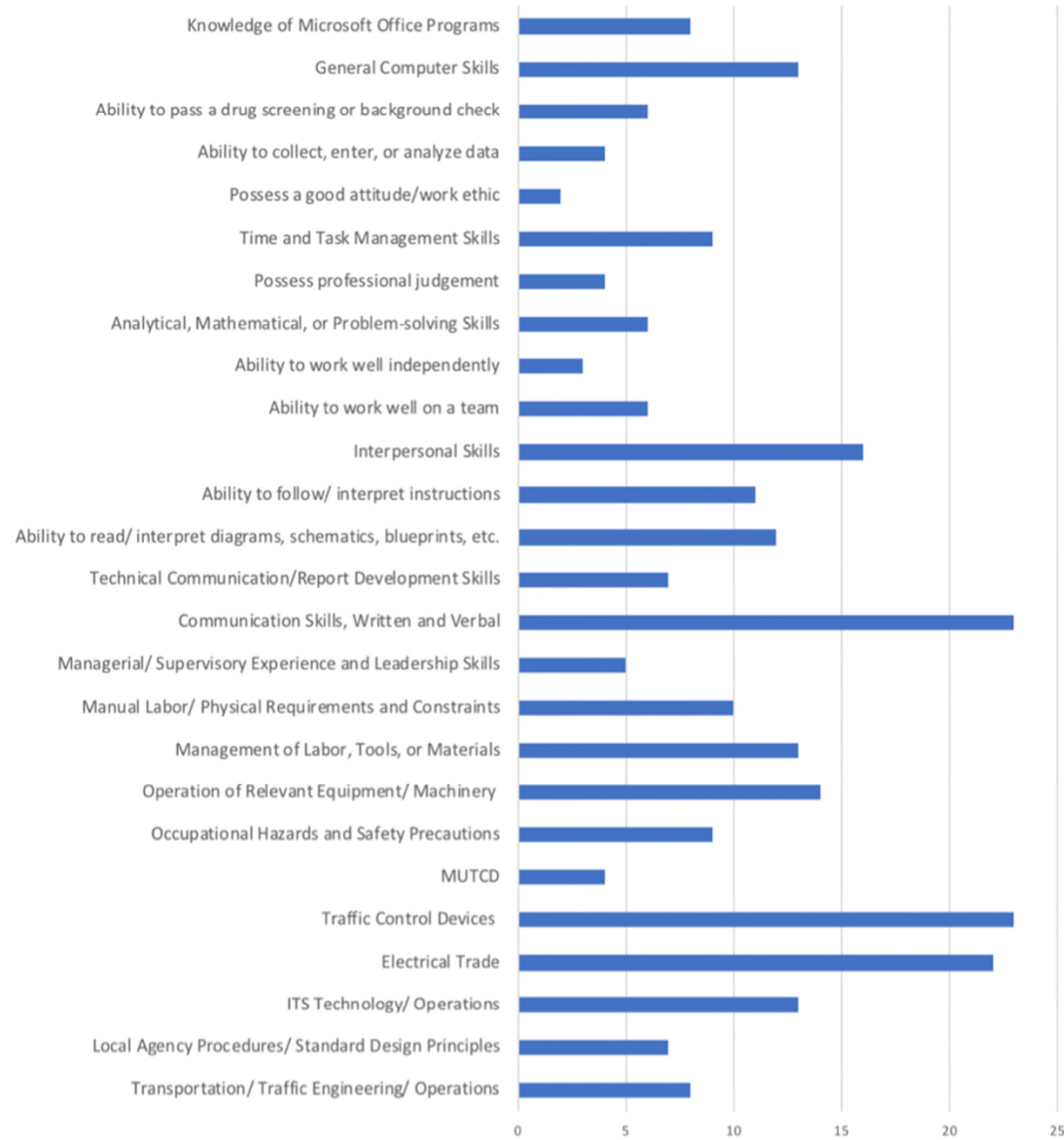


Figure 1.3.1. Most Sought-After Competencies for Traffic Signal/ITS Technicians

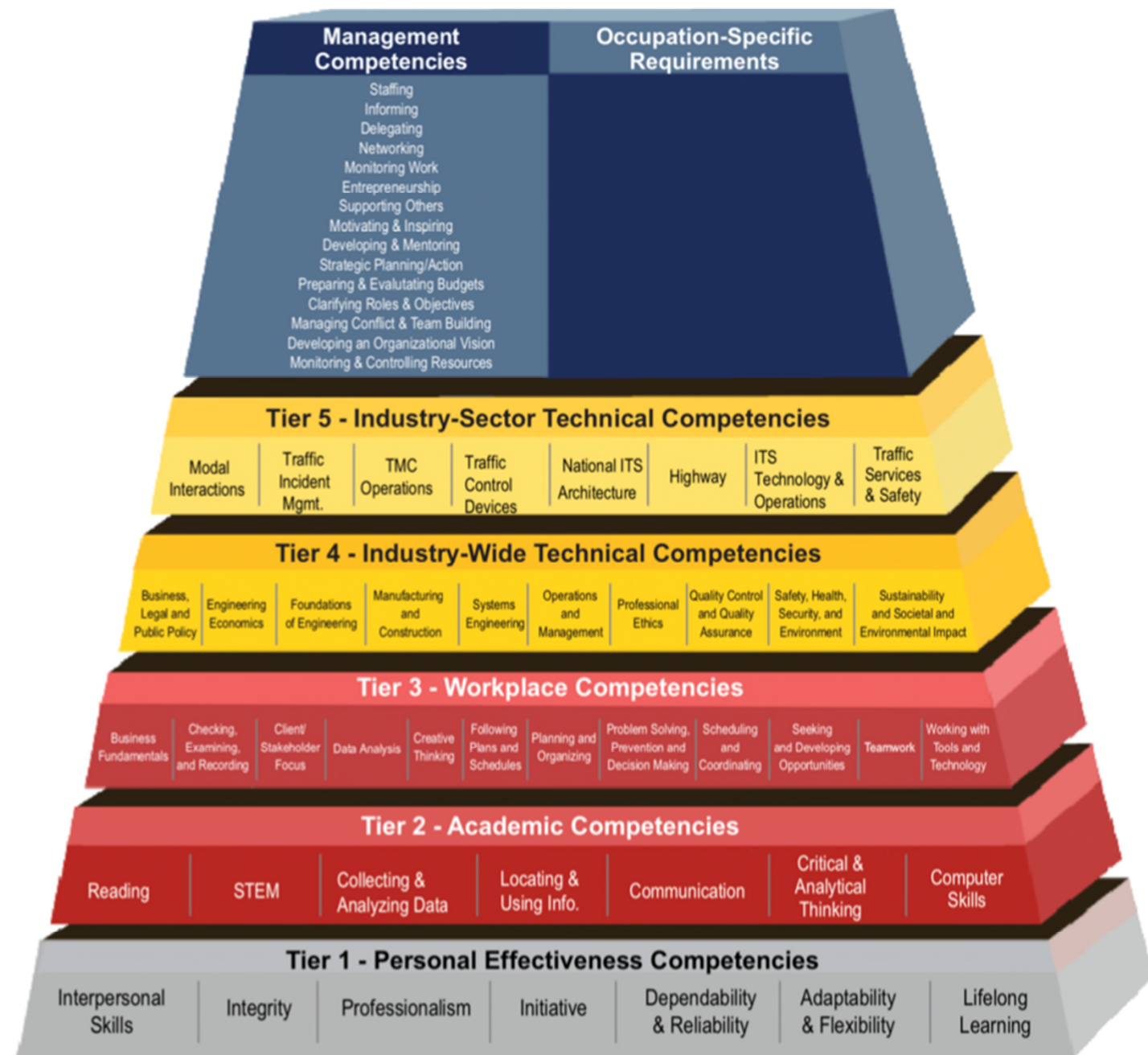


Figure 1.3.3. Competency Pyramid for Traffic Operations



Job Description: Traffic Engineer (Traffic Operations)



Alternative Job Titles

Entry-Level Engineer, Traffic Operations Engineer, Traffic Operations Program/Project Manager, Traffic Engineer, Traffic Program/Project Manager, Advanced Traffic Operations PM/Engineer

Job Description

A traffic engineer will execute traffic signal, traffic operations, and intelligent transportation system design projects using civil engineering principles. A traffic engineer may work on traffic warrant and parking studies, transportation planning studies, traffic event management studies, and traffic signal/roadway design projects. Other design projects may include integration of connected and automated vehicle infrastructure, roundabouts, pavement markings, signings, and temporary traffic control devices. A senior engineer may review and make recommendations on existing and proposed signals, delineation, roadway lighting, and pavement markings. A traffic engineer should execute traffic engineering functions and activities to ensure efficient and safe traffic operations. An engineer with project management duties will manage project scope, schedule, and budget and serve as lead to bring a project to completion. Other responsibilities may include:

- Use of engineering software and equipment to perform engineering tasks.
- Collection and preparation of data for evaluation and engineering reports.
- Coordination of projects from planning through final design.
- Design or management of transportation facilities operations.
- Management of staff and technical resources for a given engineering project.
- Coordination of project tasks across a variety of stakeholders.

Knowledge Requirements

- Transportation/ Traffic Engineering/ Operations
- Local Agency Procedures/ Standard Design Principles
- Project Management Practices
- MUTCD
- ITS Technology/ Operations
- Highway Capacity Manual
- ITE's Traffic Engineering Handbook and Trip Generation Manual
- AASHTO

Technical Skills Requirements

- Synchro, VISSIM, SimTraffic, HCS, Sidra, VISTRO, CORSIM, AutoCAD, MicroStation
- GIS Software, Geopak
- General Computer Skills, MS Office

Education & Work Experience

- Master's degree preferred; bachelor's degree required.
- Major coursework in civil engineering with traffic or transportation emphasis sometimes preferred.
- EIT/PE License commonly required; PTOE sometimes preferred.

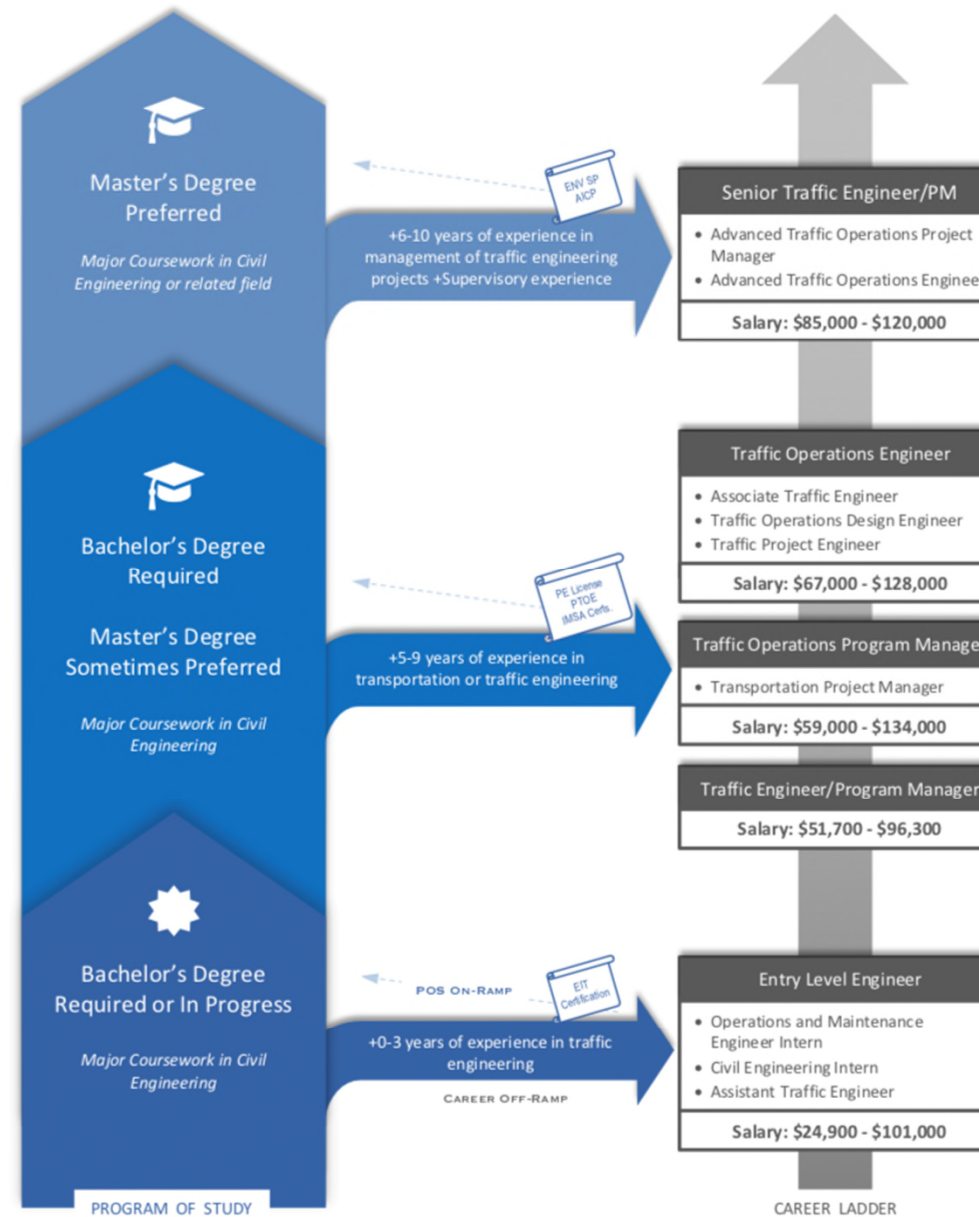
Required Skills & Abilities

- Communication Skills, Written and Verbal
- Managerial/ Supervisory Experience and Leadership Skills
- Interpersonal Skills
- Time and Task Management Skills
- Technical Communication/Report Development Skills
- Analytical, Mathematical, or Problem-solving Skills
- Ability to be innovative or creative
- Presentation Skills
- Possess a good attitude/work ethic
- Ability to work well on a team
- Organizational Skills/Attention to Detail
- Ability to work well independently
- Possess professional judgement
- Ability to work in fast-paced or stressful environment

Typical Salary

- \$24,900 - \$134,000

Career Pathway: Traffic Engineering (Traffic Operations)





Transportation Playbooks

Transportation-STEM Academy (T-STEM):
A playbook for developing transformational educational experiences through industry-academia partnerships

U.S. Department of Transportation Federal Highway Administration | THE UNIVERSITY OF MEMPHIS Southeast Transportation Workforce Center | SCS

Women in Transportation Playbook: Inspire, Engage and Empower

U.S. Department of Transportation Federal Highway Administration | THE UNIVERSITY OF MEMPHIS Southeast Transportation Workforce Center

www.memphis.edu/setwc



TSMO Workforce Guidebook

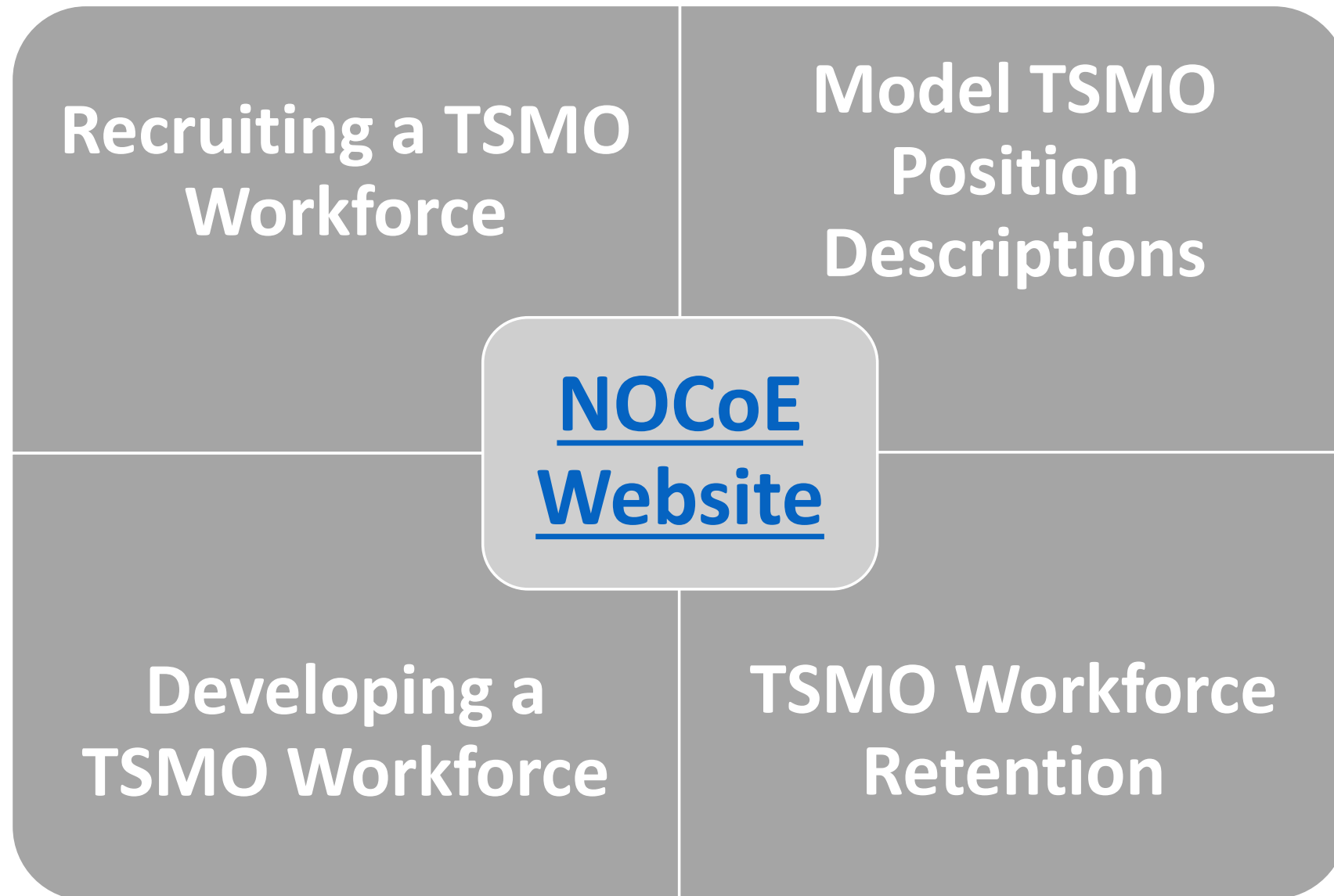
Goal: Assist transportation agencies in advancing TSMO maturity through workforce development.

- **GET GUIDANCE:** People at transportation agencies looking to begin or advance a TSMO program
- **GET ADVICE:** People involved in recruiting, hiring, or training in the transportation operations field
- **UNDERSTAND CHANGING ROLES:** Consultants working with TSMO programs
- **KNOW HOW TO PREPARE TOMORROW'S WORKFORCE:** Educators at the undergraduate and graduate levels

NOT ONE SIZE FITS ALL



TSMO Workforce Guidebook



<https://transportationops.org/workforce>



TSMO Workforce Guidebook

- 19 different positions descriptions created
 - Pick and choose
 - “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 Capability Maturity Model (CMM) improvement
 - Knowledge, Skills Abilities for position
- Positions descriptions designed as starting point – Modify to fit agency needs

TSMO Workforce Guidebook

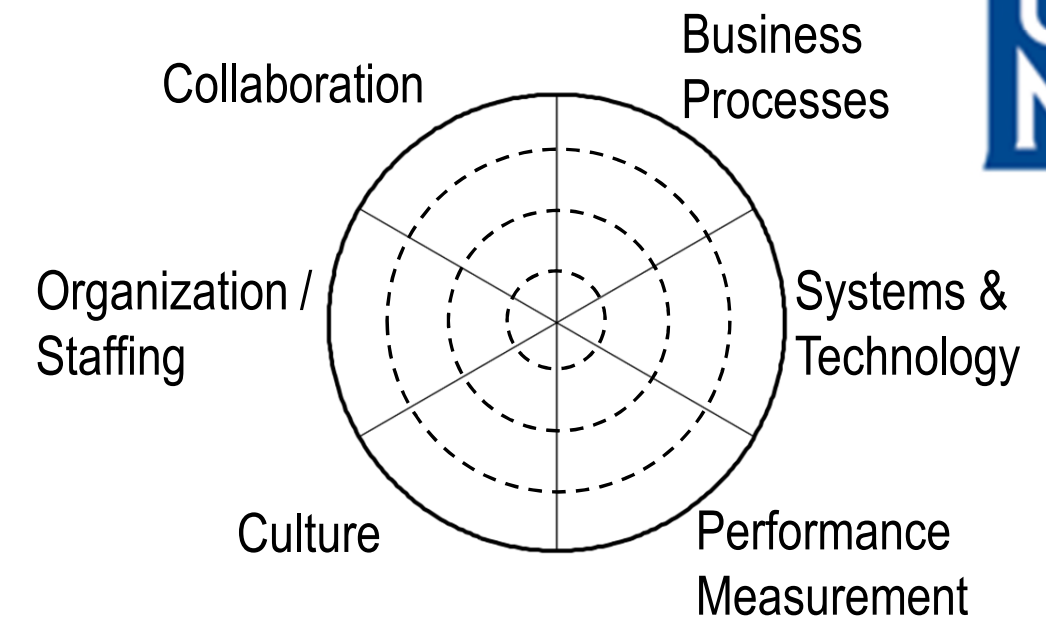


Traffic Data Scientist/Statistician	Cyber Security Engineer
TSMO Manager/Chief/Bureau Director	Transportation Data Ethicist
TSMO Program Manager	Surface Weather Specialist
Computer Engineer	Systems Engineer
Artificial Intelligence Scientist	TSMO Modeling Specialist
Telecommunications Engineer	Emerging Technologies Industry Liaison
Data Management Specialist	Transportation Systems Performance Manager
Visualization Specialist	Integrated Corridor Management Manager
Connected and Automated Vehicles (CAV) Program Manager	Transportation Management Center Manager
Traffic Incident Management (TIM) Program Manager	

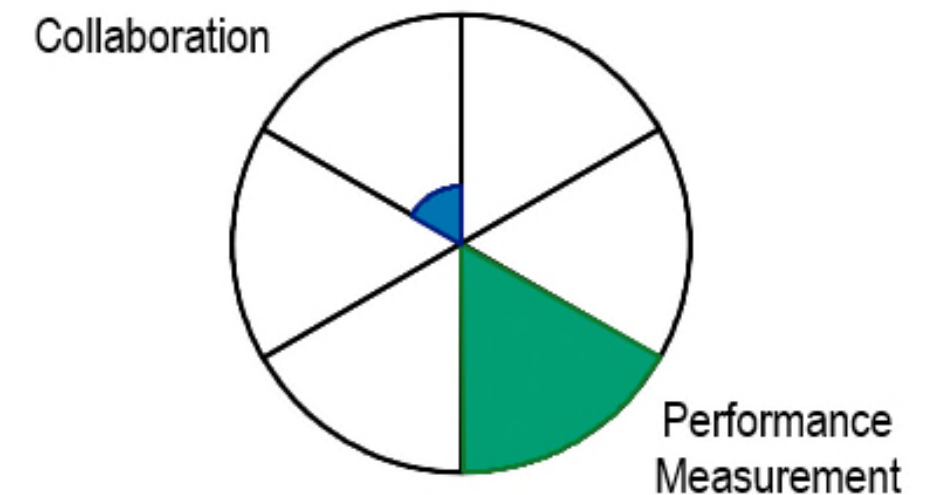
TSMO Workforce Guidebook



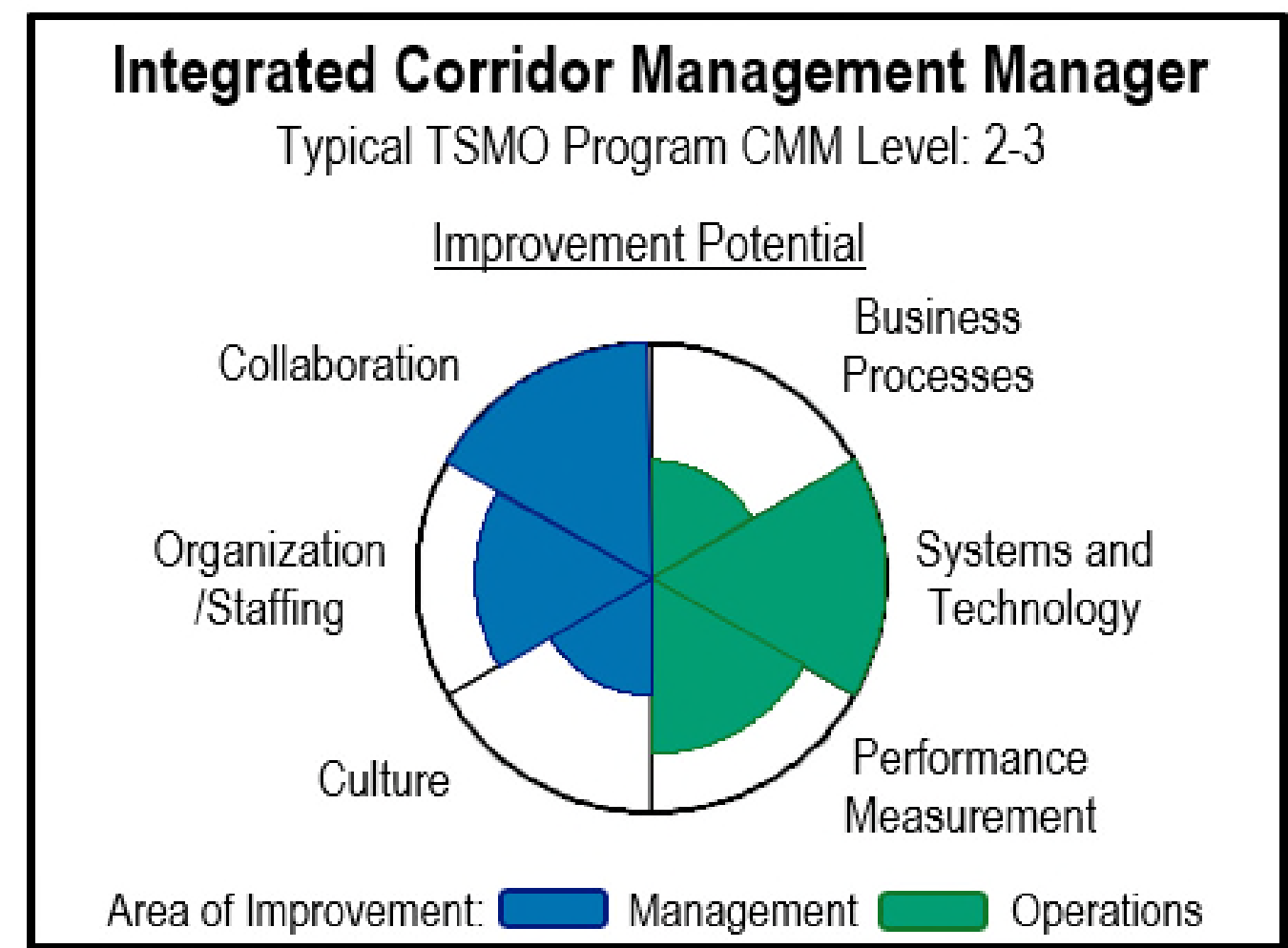
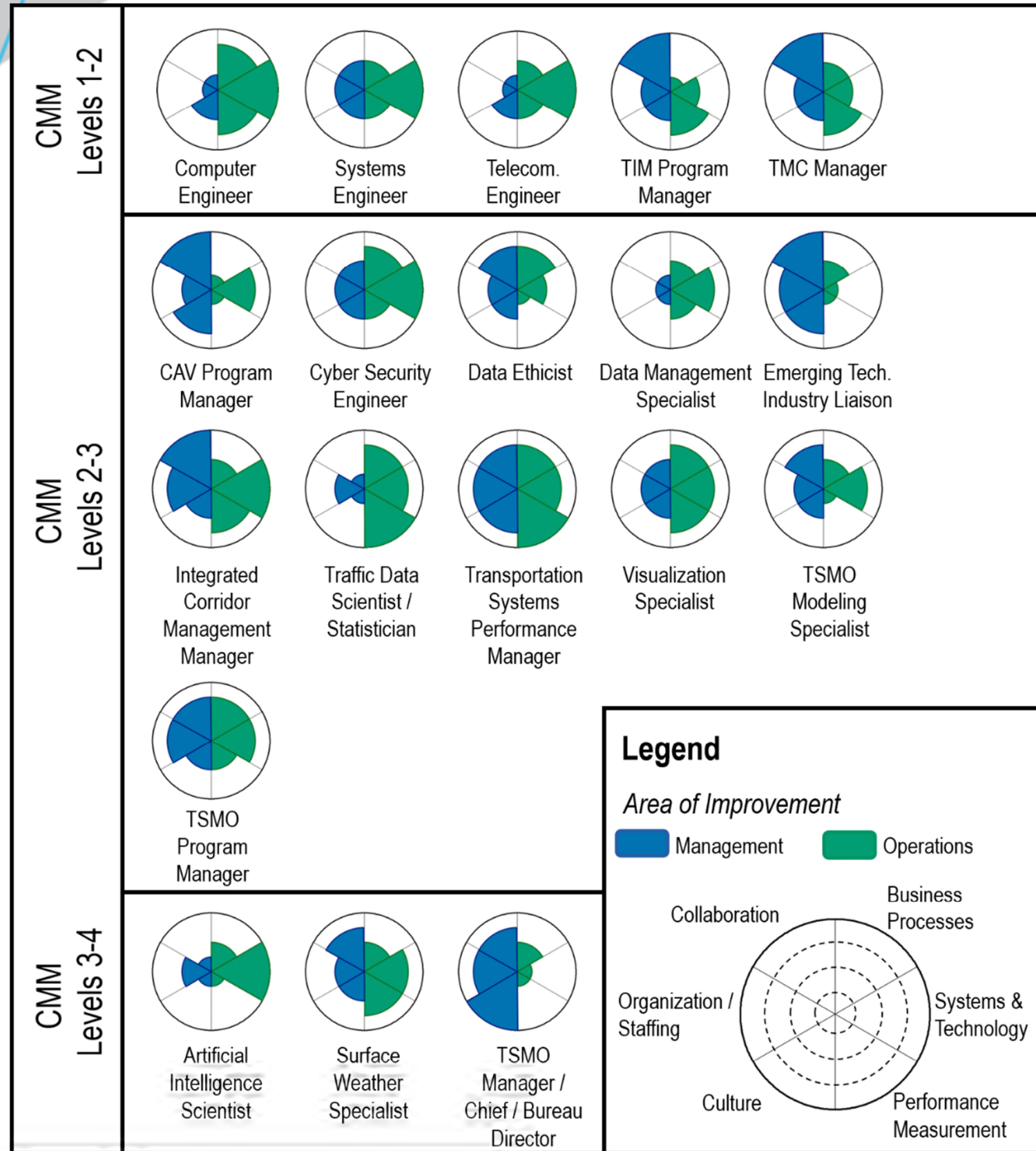
- Management
 - Collaboration
 - Organization/Staffing
 - Culture
- Operations
 - Business Processes
 - Systems and Technology
 - Performance Management
- The more the radial graphs are filled out the higher potential to improve CMM category



Improvement Potential



Area of Improvement:  Management  Operations





TSMO Workforce Guidebooks

Knowledge	Skills	Abilities
<ul style="list-style-type: none">• Knowledge of Transportation, Traffic Engineering, Operations• Knowledge of Project Management Practices• Knowledge of Local Agency Procedures, Standard Design Principles• Knowledge of ITS Technology, Operations	<ul style="list-style-type: none">• Managerial/Supervisory Experience and Leadership Skills• Communication Skills, Written/Verbal• Technical Communication and Report Development• Interpersonal Skills• Time and Task Management Skills• Analytical, Mathematical, or Problem-solving Skills	<ul style="list-style-type: none">• Ability to be Innovative or Creative• Ability to Work Well on a Team• Possess Professional Judgment• Ability to Collect, Enter, or Analyze Data

Integrated Corridor Management Manager KSAs



TSMO Workforce Guidebook

Desired Information	Guidebook Section
<ul style="list-style-type: none">• An understanding of the evolving skillsets and backgrounds needed for successful and innovative approaches to TSMO.• Understanding when an agency is ready to hire TSMO personnel.• Recommendations and best practices for hiring TSMO positions.	Chapter 2. Recruiting a TSMO Workforce
<ul style="list-style-type: none">• A description of 19 TSMO-related positions and the knowledge, skills, and abilities required by each position.• Information on when, where, and how to recruit for each of the TSMO-related 19 positions.	Chapter 3. Model TSMO Position Descriptions
<ul style="list-style-type: none">• Crafting a professional development plan for the TSMO workforce.• Information on TSMO-related educational programs at the undergraduate and graduate level.• Information on TSMO-related professional development courses.• Areas of investment to strengthen a TSMO workforce.	Chapter 4. Developing a TSMO Workforce
<ul style="list-style-type: none">• Recommendations and best practices for TSMO workforce retention through improvements to training and professional development, human resource benefits, and workplace culture.	Chapter 5. TSMO Workforce Retention
<ul style="list-style-type: none">• List of TSMO-related educational programs at the undergraduate and graduate level.• List of TSMO-related professional development courses and training programs.• Example TSMO-related position descriptions.	Appendices



TSMO Workforce of the Future

- Rapid evolution of technology transforming system operations and how work is done
- Increased emphasis on interconnected mobility – and emerging markets/modes
- Transform data into information – and other data considerations
- Complexity of problems blurs lines between disciplines
- Lifelong learning is essential



TSMO Workforce of the Future

- Evolution of positions – and emerging roles
- Complication of career pathway models
- Limited awareness
- Competition from other industry segments

*The workforce of the future must possess more **interdisciplinary skills** that cross over traditional boundaries of academic preparation.*

Which of the following do you see as the biggest challenge for developing a robust TSMO workforce?





TSMO Workforce of the Future

- Evolution of positions – and emerging roles
- Complication of career pathway models
- **Limited awareness**
- Competition from other industry segments

*The workforce of the future must possess more **interdisciplinary skills** that cross over traditional boundaries of academic preparation.*



Transportation Workforce of the Future

- Must reach students EARLY
- Elevate awareness of (and respect for) all transportation jobs – STEM for all
- Strong partnerships between academia and industry
- Diversity matters! Recruitment and retention efforts must evolve to attract diverse workers
- Continuous training requirements

Intelligent Transportation Systems – Professional Capacity Building (ITSPCB)



- Focused on ITS academic pipeline
 - K-12
 - Technical and community colleges
 - Universities
- Comprehensive and collaborative effort by NNTW
- Develop enhanced resources linking real world practice to academic content

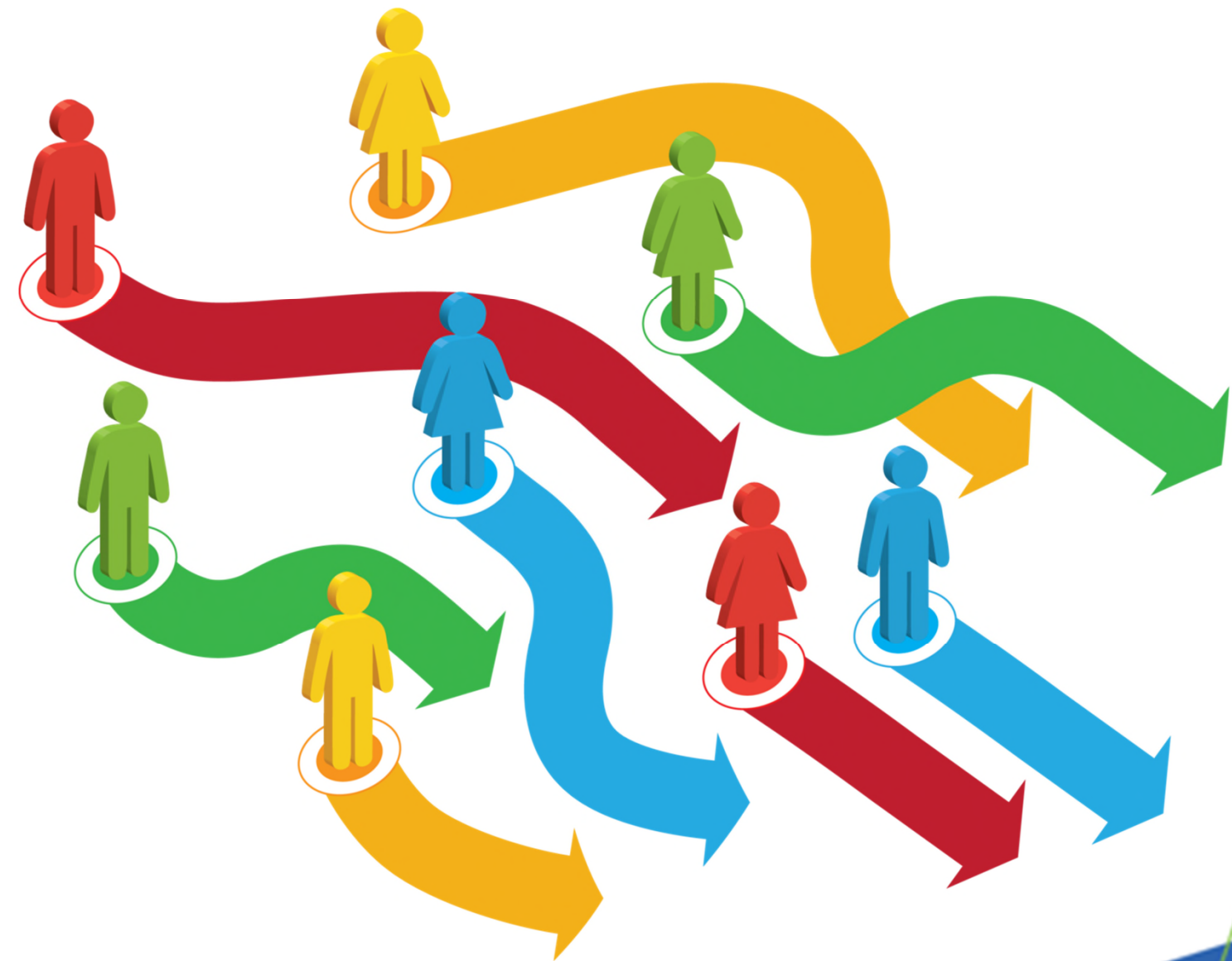


www.pcb.its.dot.gov

Intelligent Transportation Systems – Professional Capacity Building (ITSPCB)



- Develop and manage Academic Communities of Practice
 - All academic levels
 - Focus on diversity
 - Connect to professional associations and employers
- Develop and manage K-12 national advisory group for
 - STEM for All (transportation centered)
 - Develop resource tool kit for teachers



Intelligent Transportation Systems – Professional Capacity Building (ITSPCB)



- Enhance ITS Case Studies
 - Revise existing
 - Adaptive Signal Control
 - Civil Design Considerations for ITS Implementations
 - Concepts of Operations
 - National ITS Architecture
 - Travel Time Based Performance Measures
 - Create new
 - Dynamic Message Signs
 - Safety Applications of ITS
 - ITS in Bus Rapid Transit
 - Planning for ITS
 - Capstone course concept
- National advisory groups

ITS ARCHITECTURE

CASE STUDY TOPIC
The National ITS Architecture Case Study is designed to introduce undergraduate and graduate students to the National ITS Architecture and its importance in project planning. The case study features video testimonials from ITS professionals and provides students with a real-world context for practicing application of the architecture in planning an ITS congestion mitigation project.

The case study provides an introduction and exploration activities related to the National ITS Architecture, sets the stage for a planned ITS project to address congestion created on game days, and allows students to apply the architecture in a mock planning process that includes identifying systems involved, mapping subsystems and services, developing project phasing recommendations, conducting cost analysis and integrating cost constraints into the project plan, and establishing evaluation metrics for the project.

This case study provides valuable learning opportunities for students in multiple disciplines such as civil engineering, electrical and computer engineering, and transportation planning. It provides students a better understanding of the complexity of the ITS project planning process and ensures they are familiar with key concepts required for successful planning, technology integration, and project implementation.

EXISTING CURRICULUM
This module supplements such courses as:

- Transportation Engineering
- Transportation Planning
- City and Regional Planning Project Courses
- Introduction to Transportation System Management and Operations
- Systems Engineering

ASSOCIATED CAREERS

- Civil Engineering
- Traffic Engineering
- Computer/Electrical Engineering
- Traffic Incident Management
- Transportation Planning

ABET STUDENT OUTCOMES
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(j) a knowledge of contemporary issues

For more information, go to [<link to Career Pathways site>](#)

United States Department of Transportation
Intelligent Transportation Systems
Joint Program Office
ITS Professional Capacity Building Program

Intelligent Transportation Systems – Professional Capacity Building (ITSPCB)



- ITS Career Path Profiles
 - Minimum of 60
 - Diverse career pathways
 - Virtual speaker series
- ITS Project Profiles
 - Minimum of 20
 - National coverage
 - Profile videos
- ITS Speakers Bureau
- Coordination across national projects/organizations



Opportunities for Engagement!

- Submit an ITS project profile
- Submit an ITS career profile
- Work with SETWC to create an ITS project video
- Join (one of the many!) advisory groups
- Provide a speaker for K-12 or college students (or both!)
- And more!

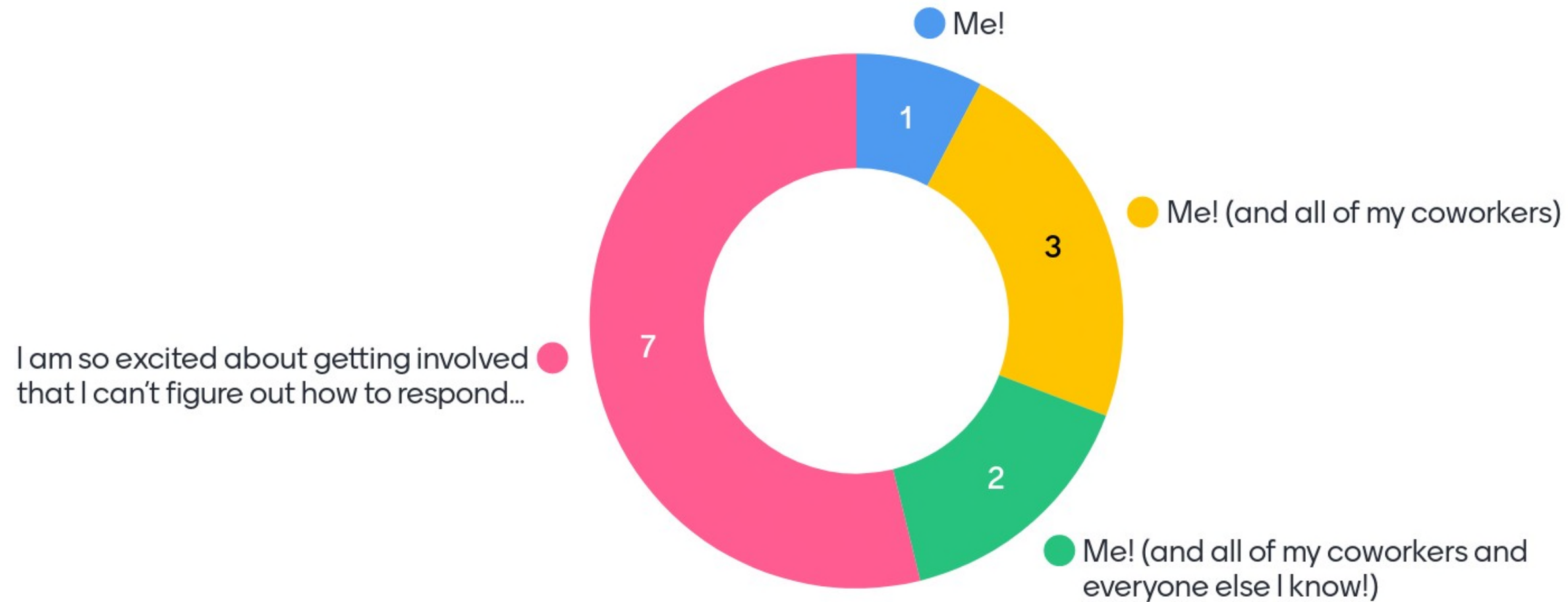


Why is this important?

- Full pipeline approach
- Don't reinvent the wheel
- Engage in collaboration
- Change the conversation
 - Students
 - Industry and academia
 - Organizational



So, who wants to get involved?



Questions?



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Additional Resources:

memphis.edu/setwc

nntw.org

transportationops.org