

2ND TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSMO) SUMMIT

CASE STUDY 2: DEVELOPING THE PARAPROFESSIONAL TSMO WORKFORCE



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CASE STUDY HIGHLIGHTS

- A consensus definition of a TSMO Paraprofessional was developed in a 2019 National Operations Center of Excellence (NOCOe) White Paper building on previous work by the American Society of Civil Engineers (ASCE).
- There are many workforce activities underway across national, state, and local agencies attempting to define the workforce needs of the future related to transportation technology.
- There is a tradeoff of working for a public sector and private sector agency. On one hand, financial compensation tends to be higher in the private sector, while the public sector offers more stability and a broader range of fringe benefits.
- As an initial estimate and subject to further refinement, it is estimated there are approximately 10,000 – 13,000 TSMO paraprofessionals across the US supporting TMCs, maintaining operational technologies, and providing critical traffic incident management services.

INTRODUCTION

New technology and data strategies have enabled organizations to better operate and manage existing transportation systems to maximize available capacity. While great gains have and continue to be made in how we manage our transportation system, new skills across the entire employment spectrum (e.g., professional, paraprofessional, skilled trades, unskilled) are required.

This case study builds on previously completed work performed by the National Operations Center of Excellence (NOCOe). It reaffirms the definition of paraprofessionals, highlights ongoing TSMO-related work by other organizations, draws a comparison between the public and private sector TSMO paraprofessional workforce, and attempts to define the current size and forecast future demand.

DEFINING TSMO PARAPROFESSIONALS

From the 2019 NOCOe TSMO Paraprofessional Whitepaper, a definition of a TSMO Paraprofessional was developed:

A TSMO paraprofessional is a position supporting the management and operations of transportation infrastructure. A TSMO paraprofessional may exert a high level of judgment in the performance of their work. TSMO paraprofessionals can comprehend and apply knowledge of basic engineering principles in the solution of broadly defined TSMO problems at a cursory level. TSMO paraprofessionals provide traffic management center operations services and a variety TSMO field services.

Paraprofessionals typically require a level of education beyond high school, routinely through technical colleges, skilled trades apprenticeships, and/or on-the-job training programs. They represent the staff that operate traffic management centers, provide maintenance to field-based operational technology, and provide motorist services through safety service patrols. From a numbers' perspective, the paraprofessional workforce is typically significantly higher than a transportation organization's professional workforce.

Interestingly, some of the original work on paraprofessionals for the engineering profession was completed by the American Society of Civil Engineers (ASCE) back in 2008. ASCE formed a task committee titled the Paraprofessional Exploratory Task Committee (PETC), whose main purpose was to explore paraprofessionals in civil engineering. The foundational work of ASCE served as a foundation for developing the TSMO-oriented definition highlighted above.

TSMO PARAPROFESSIONAL WORKFORCE DEVELOPMENT ACTIVITIES

Over the course of the last several years, NOCoE and several other organizations have advanced TSMO paraprofessional workforce development.

NOCoE

- *Paraprofessional White Paper* – As follow-up to NCHRP 20-7 (408) that focused almost exclusively on professional (i.e., degreed) workforce needs, NOCoE commissioned a white paper in 2019 to lay out an initial roadmap for advancing a variety of paraprofessional workforce development issues including:
 - 1) Conduct a market study identifying market size and current workforce, performing market predictions and overlapping analysis of KSAs in the market that are also in demand in other industries.
 - 2) Conduct a robust Capability Maturity Model (CMM) evaluation to determine how the evolving TSMO paraprofessional positions affect organizations.
 - 3) Develop a strategic management framework for recruiting, developing, and retaining tailored to TSMO paraprofessional staff.
 - 4) Develop evolving and emerging TSMO paraprofessional job position descriptions, as well as corresponding knowledge, skills, and abilities.
 - 5) Conduct a national survey to determine challenges, opportunities, and best practices for recruiting and retaining an adequate TSMO paraprofessional workforce.
 - 6) Conduct a scan of college and technical school courses related to TSMO paraprofessionals, as well as training available for TSMO paraprofessionals outside the formal college/technical school setting.
- *Washtenaw Community College: How Collaboration between Education and Industry Can Advance the Transportation Workforce* – NOCoE developed a case study that focused on how the southeastern Michigan college leveraged experience of the Michigan Department of Transportation (MDOT), local Michigan Road Commissions and the growing automotive and transportation technology sector, to tackle short-and long-term workforce needs for diverse technical skills that employers in the region are seeking. Highlighted advancements over the course of seven years include:
 - 1) Seed funding for strategic thinking to determine its niche role, given its location in southeastern Michigan
 - 2) Effective, ongoing engagement with transportation employers to better understand their needs and develop realistic career pathways
 - 3) Partnership with academic institutions to better contextualize and interact with all facets of the education field
 - 4) Testing of programs to ensure they offer the right skills

- 5) Visible, sustained interaction in the fast-moving transportation field with key partners and stakeholders to remain aware of workforce needs and opportunities
- 6) Creative work to develop revenue generating services to ensure sustainable programming
- 7) Long-term investment in K-12 programs to foster future interest in technical transportation services

Federal Highway Administration (FHWA)

FHWA supports a variety of transportation workforce initiatives, some direct and others through sponsored research programs.

Office of Innovative Program Delivery-Center for Transportation Workforce Development

- National Network for the Transportation Workforce (NNTW) - The NNTW is a collaborative of university-based research centers that seek to connect, empower, and advance the transportation workforce through targeted research, education, and industry engagement. The four universities are geographically diverse and focus on different workforce areas:
 1. Southwest Transportation Workforce Center
Center for International Trade & Transportation at California State University, Long Beach
 2. West Region Surface Transportation Workforce Center
Western Transportation Institute at Montana State University
 3. Northeast Transportation Workforce Center
Transportation Research Center at University of Vermont-Burlington
 4. Southeast Transportation Workforce Center
University of Memphis (TN)

Collectively, NNTW has worked on a variety of initiatives that include paraprofessionals including:

- *National Transportation Career Pathways Initiative* – Work included developing a wide range of career path options within the disciplines of operations, safety, engineering, environment, and planning anticipated over the next 10-15 years. For each career path option, details have been provided on the types of occupations anticipated at the entry, mid, and senior levels. The information includes a mix of professional and paraprofessional occupations.
- *Interviews with Transportation Professionals* – Several dozen people across a wide range of occupations were interviewed with a focus on what drew each person into the transportation profession through a publication called Transportation Spotlight. About a quarter of the interviewees qualify as paraprofessionals.
- *Building out the ITS Career and Academic Pipeline to Secondary Education Programs* – while not directly related to paraprofessionals, there are many strategies that can be adapted.

Office of Operations

- Workforce issues have been integrated throughout a variety of publications from the Office of Operations. Examples include:
 - Fact Sheet: Enhancing Transportation: Connecting TSMO and Human Resources
 - Organizing for TSMO - 2020 Peer Exchange Report
 - Organizing for TSMO Case Study: Organization and Staffing

USDOT Intelligent Transportation Systems Joint Program Office (JPO)

- *ITS PCB Virtual Community College Workshop Series* – Held during the summer of 2020, the multi-week collaborative event convened educators and practitioners to define current and emerging

entry-level ITS technician needs, discussed the technical skills taught at community college programs, and evaluated the potential for bridging the current knowledge, skills, and abilities gaps through community college partnerships.

- *Community College Working Groups* – Initiated in Fall of 2020, four working groups continue to advance a variety of topics, which are as follows:
 - Working Group #1: Outreach and Recruitment – Developing a sustained and systematic approach engaging community colleges, technical schools, and four-year institutions to align curricula with workforce needs.
 - Working Group #2: Strengthening the ITS Workforce with Community College and Tech School Graduates – Developing methods to connect graduates with potential employers.
 - Working Group #3: ITS Technician Job Market – Developing the data and business case for to demonstrate how Community colleges could contribute and justify adding academic programming.
 - Working Group #4: Connected and Automated Vehicle Education (CAVe)-In-a-Box– Refining how a hands-on learning experiences can aid curriculum and support instruction for community colleges and trade schools, facilitate benchmarking connected vehicle equipment, and support onboarding of ITS technicians.
- *ITS Project and Professional Profiles* – A series of profiles have been developed that highlight professionals in ITS-related careers and ITS projects that have been deployed around the country. The initiative is intended to create a resource that tells the story of ITS to increase awareness and attract students to the field. While the majority of the existing profiles are of engineering professionals, effort is currently underway to create an additional set of profiles that highlight stories of paraprofessionals.

International Municipal Signal Association (IMSA)

IMSA provides a service to the TSMO paraprofessional community through training and certification. The most popular certification IMSA provides is related to traffic signal technicians. IMSA supports certifications at several other categories related to fiber optics, TMC operators, and work zone management as shown in Table 1.

Table 1. IMSA TSMO Paraprofessional Certifications

Traffic Signal Technician	Traffic Management Centers
<ul style="list-style-type: none"> • Traffic Signal Technician-Level 1 • Traffic Signal Bench Technician-Level II • Traffic Signal Design/Engineering Technician-Level II • Traffic Signal Field Technician-Level II • Electronics in Traffic Signal Technician • Traffic Signal Inspector • Traffic Signal Tech-Level II (Construction) • Traffic Signal Inspector for Advanced Technologies 	<ul style="list-style-type: none"> • Transportation Center System Specialist-Level I • Transportation Center System Specialist-Level II
	Work Zone Management
	<ul style="list-style-type: none"> • Work Zone Temporary Work Zone Technician
	Fiber Optic Communications
	<ul style="list-style-type: none"> • Fiber Optics Technician

STATE AND REGIONAL LEVEL EXAMPLES

- *Northwest Passage Pooled Fund Program* – The Northwest Passage Pooled Fund Study, comprised of the state DOTs along I-90 and I-94 Corridors from Minnesota to Washington completed a project in 2020 entitled, “*North/West Passage Workforce Needs: Practices and Peer Exchange*”. The project focused on identifying current practices, challenges/needs, and practices that have worked well across several topics:
 - Staffing and Assignments
 - Recruiting and Hiring
 - Succession Planning and Staff Turnover
 - Career Development
 - Training and Certification
 - Contracting to Fill Gaps

The final report included discussion on both professional and paraprofessional workforce development. It is also one of the first reports to highlight best practices related to the pandemic.

- Michigan – Several studies focusing specifically on the Connected and Automated Vehicle (CAV) workforce have been developed:

The University of Michigan Economic Growth Institute completed a study entitled, “*Understanding the Middle Skill Workforce in the Connected & Automated Vehicle Sector*”. The final report amplifies and reinforces the required evolution of CAV auto technicians. Increasingly, base mechanical skills are less important with a shift towards skills in software, systems, and cyber security.

The Workforce Intelligence Network (WIN) for Southeast Michigan provided a 2020 update to its original 2017 study entitled, “*Connected and Automated Vehicles Emerging Technology Skills Gap Analysis*”. The report recommends:

1. Flexibility in degree programs to encourage more participation in the CAV space while also expanding use of middle skill positions.
2. Improved Collaboration across education, employers, and workforce boards to fill both short- and long-term skill needs.
3. Employers collectively work together to attract technology talent to southeast Michigan.

- Minnesota – Minnesota DOT Recently completed a broad reaching study entitled, “*Workforce Planning and Human Resource Development Strategies for Minnesota's Public Transportation Agencies*”. The study included a comprehensive survey that explored and examined possible causes of the workforce shortage in Minnesota’s transportation industry. The findings showed a general level of agreement for a shortage of qualified individuals.

COMPARISON OF PUBLIC AND PRIVATE SECTOR TSMO PARAPROFESSIONAL WORKFORCE

The first TMCs were operated by staff of the owning agency. Today, many DOTs providing TSMO services such as traffic management, incident management, traveler information, etc. are supported by specialty service contracts for TMC operations staff, safety service patrols, ITS maintenance services, etc. This translates to various segments of the TSMO paraprofessional workforce being hired by private entities under public agency contracts and varies significantly by organization. Privatization of TSMO public

services can be attributed to several contributing factors. For one, the successful operation of a TMC and associated systems often requires specialized services outside those normally found in a transportation agency, such as software engineers, IT technicians, database specialists, etc. Public agencies face challenges in hiring and attracting these specialized positions and thus look to the private sector to help fill in gaps.

Table 2 highlights the difference across public and private sector TSMO paraprofessionals across several categories.

Table 2. Differences between Public and Private Sector TSMO Paraprofessionals

Category	Comparison
Training and Professional Development	Public sector usually provided more opportunities for training and professional development (especially on-site). Private sector training programs are focused on on-the-job training.
Hiring	Process for hiring within public sector tends to be more complicated and drawn-out, whereas the private sector has much more flexibility on hiring talent under different employment scenarios (e.g., contract/gig, hourly, salary, etc.)
Churn/Turnover	The rate in which staff turns over is higher in the private sector (estimated at approximately a 3 year difference).
Work Hours	Public Sector usually has more control over work hours, while private sector work is typically controlled by the terms of the contract.
Stability	Public sector usually has a longer term view of stability because they are not tied to a future contract re-compete. For example, many TMC operators change employers based on the company that has won the most recent contract. Also, in some cases public sector workers are protected under collective bargaining agreements that offer an added level of stability.
Compensation	Hourly wages are typically higher for private sector. Also, the opportunity for bonus compensation is much higher in the private sector. However, depending on the specific job classification, labor laws and collective bargaining agreement, public sector employees may qualify for higher overtime compensation. Employee referral bonuses are also more relevant in the private sector.
Time Off	Fringe Benefits in the public sector are better. For example, many public agencies still have separate vacation and sick leave categories, whereas most of the private sector works with a single paid-time-off (PTO) accrual model.
Retirement Savings	In most cases, public sector retirement savings options are better compared to the private sector. Many public sector organizations still support a defined benefit pension, whereas most of the private sector works under a defined contribution model where the company may match a portion of your contribution.
Other Fringe Benefits	Across the board, the public sector tends to provide a broader range of fringe benefits. Examples include educational assistance, employee assistance programs, On-site stress management program, on-site fitness centers, on-site medical services, etc.

ESTIMATES OF TSMO PARAPROFESSIONAL WORKFORCE SIZE AND PROJECTED GROWTH

Estimating the size and future growth to jobs specifically related to TSMO has been a challenge for professional and paraprofessional positions due to a lack of discreet US Bureau of Labor Statistics (BLS) categories. For the sake of the developing an estimate, we offer several assumptions:

- Using a conservative estimate approximately 325 TMCs across the US, assuming about 1/3 functioning in a 24/7 capacity and 2/3 functioning during regular business hours translates into approximately 3,000-3,500 TMC Operators and Supervisors.
- Using the basis of an average state having approximately 15-20 technicians to maintain TSMO-related operational technology across 325 TMCs translates into approximately 4,500-6,000 TSMO Field Technicians.
- Based on a sample of 9 states that average 50 safety service patrol drivers per state translates into approximately 2,500-3,000 drivers nationwide.

As far as growth goes, BLS occupations similar to TSMO paraprofessional positions were investigated such as Electronics and Electric Technician, Heavy Vehicle and Mobile Equipment Service Technicians, Telecommunications Equipment Installers and Repairers, Computer Support Specialists, and Electricians. Collectively, it is estimated the TSMO Paraprofessional Workforce has a projected growth from 2019-2029 in the range of 3-4%, which is in line with the projected average of 3.7% across all occupations.

As an initial estimate and subject to further refinement, it is estimated there are approximately 10,000 – 13,000 TSMO paraprofessionals across the US supporting TMCs, maintaining operational technologies, and providing critical traffic incident management services.

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