



2nd Transportation Systems Management And Operations (TSMO) Workforce Development Summit

Proceedings

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Highlights

When and Who

On September 20 and 23, 2021, the 2nd Transportation Systems Management and Operations (TSMO) Workforce Development Summit was held virtually. Participation included a broad range of over fifty state DOT, city, county, planning organization, academic, association and industry representatives. This included a blend of TSMO practitioners and human resource (HR) professionals. As Martin Knopp, Associate Administrator for Operations, FHWA, said, NOCoE gathered the “hall of fame of TSMO practitioners.”

Structure and Methodology

Figure 1 illustrates the process used during the summit. The first day of the summit identified workforce development issues at professional and paraprofessional levels. The second day of the summit focused on developing and prioritizing ideas, understanding the importance and feasibility of high priority ideas, and identifying potential champions and resources. The information developed during the summit served as the basis for identifying the actions identified below. A full implementation plan will be published in 2022.

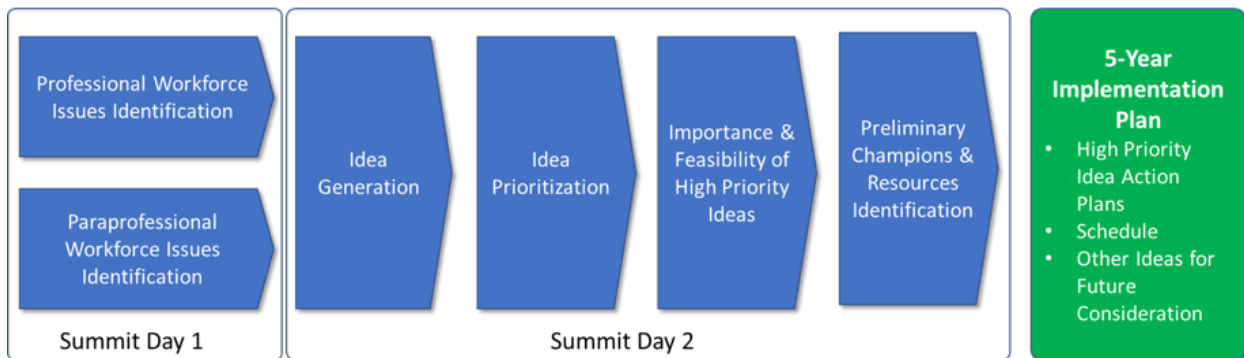


Figure 1. Summit Methodology

Major Themes

Diversity, Equity, and Inclusion Is Essential to a Strong TSMO Workforce: Dr. Shawn Wilson, Secretary of Louisiana DOTD, and incoming AASHTO President, led the summit’s day 2 discussion by emphasizing the need to intentionally expand opportunities within the transportation community by creating a culture that identifies, trains, and empowers individuals in under-represented populations covering age, gender, ethnicity, and race. Attendees worked to identify major actions that could attract, develop, and expand the workforce, including strengthening of recruitment pipelines, increasing apprenticeship opportunities, and developing resources highlighting TSMO as a career of choice.

Pre-Employment Education: Breakout discussion focused heavily on strengthening pre-employment education, including adding a focus on TSMO. Potential actions include: developing a business case for academia to focus more on TSMO, creating a new university program for TSMO, and leveraging existing technical education programs to include TSMO.

The TSMO Guidebook is Being Used: Commissioner Sheehan, NH DOT and outgoing AASHTO President led off the summit discussion by highlighting the usefulness of the TSMO Workforce Guidebook and attendees responded positively when asked about the usefulness of the guidebook’s contents. However, gaps were also identified in where adoption of the guidebooks content and substance could be applied inside organizations.

What’s Next?

As one of its three strategic goals, NOCoE plans to incorporate the summit content and action items into its long-term strategic planning process. NOCoE’s approach is to develop workforce goals that 1) attract, 2) develop, 3) sustain, and 4) expand the TSMO workforce. The potential summit actions items are identified below within these four strategic areas.

NOCoE is working with its partner organizations, including AASHTO, ITE, ITS America, and FHWA, on implementing summit action items and will release a strategic implementation framework in early 2022. The implementation approach will seek to both leverage the ongoing leadership of these partners and the other organizations represented during the summit, but will also include seeking partnerships with non-transportation specific organizations to expand awareness and leverage differing perspectives.

Potential Action Items	Attract	Develop	Sustain	Expand
Provide ongoing awareness of TSMO workforce issues and resources			X	
Develop resources highlighting TSMO as career of choice	X			
Develop business care for academia to focus more on TSMO		X		X
Leverage existing programs with additional funding and promotion				X
Develop best practices guide for TSMO technical training		X	X	
Strengthen pipelines (military, tech. colleges, 1st responders, HBCU, etc.	X			X
Perform research on non-traditional workers				X
Increase TSMO apprenticeship and co-op opportunities	X	X		X
Develop guidance on succession planning, retention, and young workers		X	X	
Create a new university program for TSMO	X	X	X	X
Leverage existing technical education programs to include TSMO	X	X		

Introduction

In June 2016, National Operations Center of Excellence (NO-CoE) convened a two-day, in-person TSMO Workforce Development Summit to discuss a variety of issues. The discussion identified a range of gaps in practice to necessitate further investigation through the NCHRP. As a result, NCHRP Project 20-07/Task 408, “TSMO Workforce: Skills, Positions, Recruitment, Retention, and Career Development” was requested by the American Association of State Highway and Transportation Officials (AASHTO) and completed in March 2019. Many other workforce activities were spun out of the 1st summit (summarized later in report).

TSMO, in particular, provides us with the opportunity to help people have an efficient reliable system that they can truly rely on.

–Victoria Sheehan

Since five years have passed since the initial summit, leaders of NOCoE and AASHTO decided to conduct a 2nd TSMO Workforce Development Summit. With the pandemic still constraining travel for many agencies, the 2nd summit was designed to be held in a virtual environment and include many interactive exercises to maximize group participation. To that end, the summit was convened over the course of two days to allow for synthesis of initial results from the first day.

Day 1: Monday, September 20, 2021

Segment 1: 12:00pm - 2:00pm

Segment 2: 2:30pm - 4:30pm

Day 2: Thursday, September 23, 2021

Segment 3: 12:00pm - 2:00pm

Segment 4: 2:30pm - 4:30pm

**all times are EDT*

Workshop Objectives

Five summit objectives were set forth during initial event planning:

- Understand previously completed or in progress TSMO workforce development activities. Affirm accomplishments and clarify areas that need more work from the first workforce development initiative
- Understand issues facing our industry at the professional and paraprofessional level
- Identify current workforce challenges and opportunities transportation agencies are facing
- Provide guidance in the development of a NOCoE TSMO Workforce Development Implementation Plan, inclusive of an appreciation of the role of partner organizations and how they can best work together

Over fifty people participated in the summit each day, covering all levels of government (federal, state, county, local), private sector (consulting and vendors), and academia (4-year and 2-year institutions). There was also a mix of technical and human resources expertise that participated. For a complete list of participants, see the list at the end of these proceedings.

Day 1 - Segment 1

WELCOME

Eric Rensel, Vice President of the Transportation Planning Practice at Gannett Fleming welcomed participants. Scott Marler, Director of Iowa DOT, and Victoria Sheehan, AASHTO President and Director of New Hampshire DOT, led opening remarks, followed by an overview of the summit's objectives, which are listed in the introduction above.

Now, five years after the first summit, workforce development remains a significant need and driver not only for TSMO, but across the transportation sector.
—Scott Marler

After participants had an opportunity to introduce themselves to the group, Jim Tymon of AASHTO and Martin Knopp of FHWA provided welcoming remarks. A poll was conducted that asked what participants would like to get out of the summit (Figure 1). The most common responses were “collaboration” and “industry guidance”.



Figure 1. Poll: In 3 words or less, what would you like to get out of the summit?

STATE OF THE INDUSTRY SINCE 1ST WORKFORCE SUMMIT

Adam Hopps presented a state of the industry overview related to TSMO workforce issues. Five priority actions from the first Workforce Summit were integrated into the NCHRP project that led to the creation of the Workforce Guidebook. The Guidebook wasn't able to address the full range of needs for the TSMO workforce. For example, the Guidebook only focused on professional positions that require a 4-year degree or above, leaving opportunities to explore issues related to the paraprofessional workforce at a later date.

Since the first summit, TSMO has become a core function of how DOTs do business, which has led to numerous case studies, formalized TSMO programs, and academic opportunities. The TSMO workforce has also developed significantly since the first summit. The following are examples of TSMO workforce development activities:

- ITS Heartland’s TSMO University Case Study looks at how to educate practitioners on establishing TSMO practices at state and local agencies as well as within private industry.
- FHWA and the ITS JPO Professional Capability Building Program continue to lead in developing the TSMO workforce with research, education programs, and curriculum development.
- Other education programs, such as the Operations Academy and Regional Operations Leadership Forums, have developed the TSMO skills of hundreds of practitioners and helped to grow the practices tremendously in the last five years.
- Organizationally, ITE’s TSMO Council continues to share best practices and provide a forum for practitioners to grow their knowledge about TSMO.
- AASHTO’s Committee on Transportation System Operations (CTSO) is sharing knowledge and working to push the industry forward, with leadership focusing on sharing best practices and research, and working on a Transportation Operations Manual to establish the practices of TSMO across the industry.

GROUP DISCUSSION: PRODUCTS FROM 1ST WORKFORCE SUMMIT

A poll was conducted that asked which aspects of the first summit are useful to participants (Figure 2); the top responses were “analysis of KSA needs vs training gaps”, “recruitment best practices”, and “strategies to elevate TSMO visibility.”

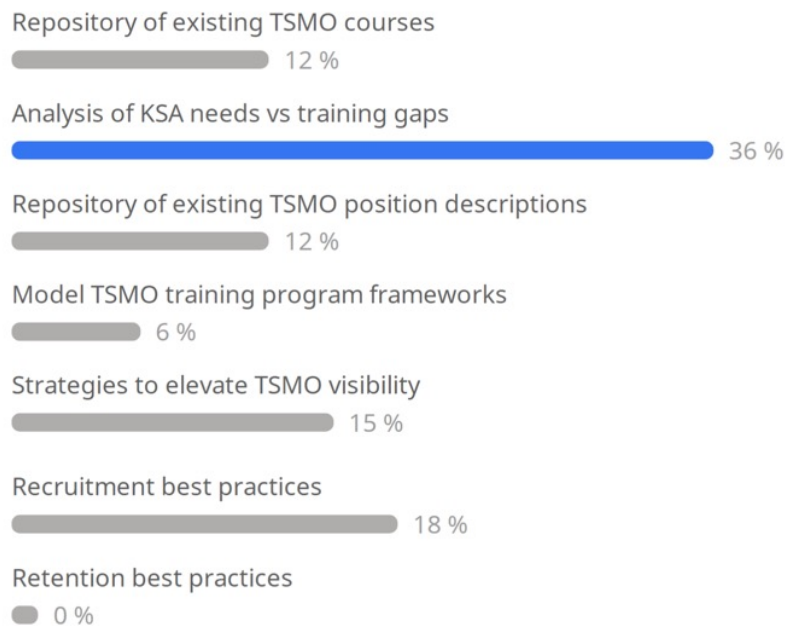


Figure 2. Poll: Which aspect of the first summit has been or is anticipated to be useful to you?

CASE STUDY 1: DEFINING THE TSMO WORKFORCE PIPELINE

Dr. Stephanie Ivey presented the first Case Study related to defining the existing and future TSMO workforce pipeline. The key challenge to defining the TSMO workforce pipeline is finding talent, which is typically found at technical schools, colleges, universities, and incumbent workers (veterans, construction industry, etc.). Barriers to increasing awareness of TSMO include visibility, hiring practices, and organizational silos. To expand the workforce pipeline, the industry should consider:

- Expanding industry-academia partnerships
- Providing exceptional learning experiences
- Casting a wider net
- Creating apprenticeship programs
- Elevating awareness of TSMO
- Recruiting from within
- Creating a culture of innovation
- Start early by investing in STEM for pre-college students

GROUP DISCUSSION: INTERNAL OR EXTERNAL TSMO WORKFORCE DEVELOPMENT CHALLENGES

A poll was conducted that asked about the challenges participants face bringing new staff into the TSMO workforce (Figure 3); the top responses included limited compensation and difficulty in both changing position descriptions and creating new positions.

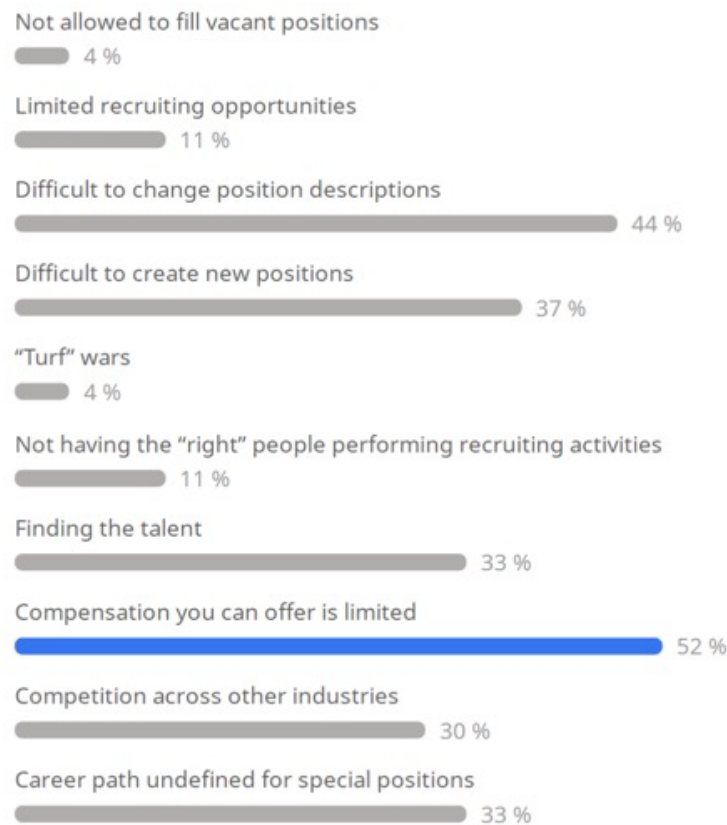


Figure 3. Poll: What internal or external challenges do you have related to the ability to bring new professional staff into the TSMO workforce?

BREAKOUT: PROFESSIONAL TSMO WORKFORCE DEVELOPMENT ISSUES

Participants were broken into three groups and used the Mural platform as an interactive white board to identify and discuss issues at the professional level (Table 1).

Table 1. At the professional level, what issues are you facing related to TSMO workforce development?

	Recruiting	Hiring Process	Training & Capacity Building	Retention	Succession Planning
Group 1	<ul style="list-style-type: none"> Lack of workforce planning and forecasting Lack of top management Support TSMO pipeline isn't working Minimal workforce data Current positions need to be redefined to fit TSMO 	<ul style="list-style-type: none"> Minimal shared positions to leverage needs across organization Civil service requirements slow down hiring process Not being proactive in hiring 	<ul style="list-style-type: none"> Re-tooling need to meet TSMO needs Minimal marketing of DOT training programs as way to attract talent Limited (or no) certificate programs 	<ul style="list-style-type: none"> Competition with other industries Minimal connections between culture and work environment Minimal forums to discuss challenges and issues 	<ul style="list-style-type: none"> Incoming workforce has less loyalty to organizations Lack of staff depth limits "apprentice" opportunities
Group 2	<ul style="list-style-type: none"> High tech sector competition Minimal awareness of transportation jobs at the K-12 level Limited recruiter awareness of TSMO jobs Lack of marketing TSMO as a cutting edge, exciting job 	<ul style="list-style-type: none"> Tight budgets, lengthy processes, and rigidity make it hard to re-tool classifications, create new jobs, and to switch job postings People don't understand what TSMO is 	<ul style="list-style-type: none"> More undergraduate training/exposure to TSMO is needed, along with portable certifications Keeping up with technological advancements Need to understand what industry wants/needs Lack of funding for training 	<ul style="list-style-type: none"> Hard to keep talent due to environment, a hot job market, etc. Compensation needs to improve Need to create a supportive workspace that welcomes diversity 	<ul style="list-style-type: none"> Lack of a clear career path Skill sets of junior staff lag behind long-term staff Not enough people to backfill positions
Group 3	<ul style="list-style-type: none"> Skill sets don't match compensation levels Hard to find talent (not sure where to look, candidates don't know what TSMO is, recent grads aren't interested in TSMO) Technology keeps changing "real time" needs 	<ul style="list-style-type: none"> HR limits job reclassification and develop job descriptions without understanding skills needed Lengthy hiring process means candidates select other positions Lack of flexibility for salary, benefits, schedule, location 	<ul style="list-style-type: none"> Try to capture college interns Consultants and DOT staff both require training Limited funding Hard to reach new audiences Information overload Not enough existing programs 	<ul style="list-style-type: none"> Desire for flexibility in work-life balance There's no time for training when they're already understaffed Not able to offer proper compensation for adding to one's skillset via training No clear career paths 	<ul style="list-style-type: none"> Try to "groom" more personnel; shadowing Succession planning not taken seriously Create overlap in positions and shared responsibilities among staff

Day 1 - Segment 2

OVERVIEW OF RELATED TSMO WORKFORCE DEVELOPMENT ACTIVITIES

Three speakers presented a brief overview of current TSMO workforce development activities:

- National Network for the Transportation Workforce – Dr. Stephanie Ivey
- USDOT ITS Joint Program Office (JPO) – Andrew Berthaume
- FHWA Office of Operations - Tracy Scriba

National Network for the Transportation Workforce

The National Transportation Career Pathways Initiative was developed for the FHWA to assess job priorities in engineering, operations, maintenance, planning, and safety under the unifying need of disruptive technologies. Career pathway charts, job descriptions, salary ranges, and other supportive information can be found on NNTW's website (nntw.org). NNTW is currently supporting the ITS Professional Capacity Building Program, specifically through academic resources. NNTW is also working on a webinar series, additional research and resources (e.g., playbooks), and career exploration tools, all with the goal of supporting workforce building.

ITS JPO ITS Professional Capacity Building (PCB) Program and Partners

To support the ITS PCB Program's strategy, adequate funding, leadership support, and partnerships are necessary. Strategic partnerships are needed with public and private entities across all transportation modes. Such partnerships will help the PCB Program:

- Expand coordination with other USDOT programs (e.g., USDOT's internal Professional Capacity Building, Outreach, Education, Training and Technology Transfer (POET3) Team) to maintain a multimodal, multi-discipline focus
- Broaden work with universities and community colleges (and other academic institutions)
- Serve as a link to national/regional workforce centers and state and local public-sector training programs
- Expand coordinated training conduits to current and future practitioners (i.e., needed training topic covered by course developed by association and advertised by ITS PCB to reduce duplication of efforts)

Focus group data indicates the transportation workforce anticipates procurement as a concern in the future and is likely to seek training in data management and system security competency areas.

Regarding academia, alignment between ITS education and the ITS field is critical due to the increasing complexity of ITS, specialized knowledge being necessary, and the prevalence of ITS on roadways. The goal of ITS academic strategies is to provide tools and services to aid ITS education at the high school, community college, university, and graduate levels. This is being accomplished using a combination of methods, including workshops, case studies, webinars, the Transportation Technology Tournament (T3), ITS E-primer, a career resource webpage, and an ITS curriculum webpage.

FHWA Office of Operations

In lieu of starting a new workforce capacity building program, the FHWA Office of Operations looked at ways to better coordinate existing efforts. A quarterly TSMO professional capacity building coordination

meeting is held with an assortment of stakeholders involved in TSMO and adjacent fields. In addition to not duplicating capacity building efforts, the Office of Operations did not want to duplicate other aspects of TSMO and instead supports existing efforts. The Office of Operations has several ongoing TSMO efforts:

Peer Exchanges and Best Practices Sharing

- There is a regional operations leadership forum in partnership with AASHTO. States go through a series of facilitated discussions and peer presentations to maximize learning at these forums.
- With the TSMO peer-to-peer program, states can get together to exchange knowledge in-person.
- The Active Transportation Demand Management (ATDM) cohort program is in the process of setting up two cohorts (state and local). The purpose is to encourage agencies to foster coordination, understand how ATDM has been incorporated into daily practices, share lessons learned, and overcome challenges together.
- Webinars covering a variety of topics are another method of peer exchange.
- Case studies and technical publications are published to share technical information and implementation methods.

Training

- FHWA is working with NHI to provide new courses and build out TSMO course offerings. FHWA is currently conducting an assessment of all training materials to identify and reduce gaps. Types of training include:
 - TIM emergency responder training
 - Work zone training
 - New product training

Technical Assistance

- Technical assistance for agencies is led by the Resource Center on an as-needed basis.

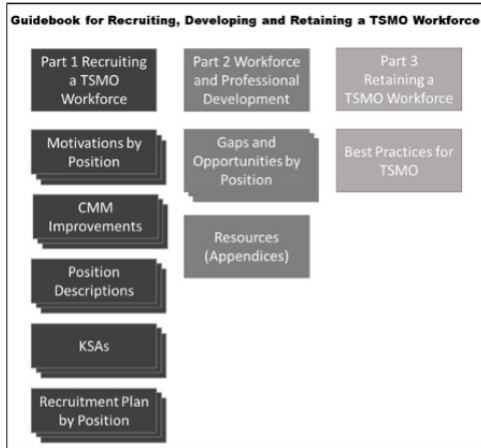
Elevating TSMO Visibility

- FHWA has been working to support TSMO visibility since the 1st TSMO Workforce Summit.
- Efforts related to planning for TSMO programs include development of a guide, posting resources online, and hosting webinars.
- TSMO mainstreaming efforts are taking place and include creating and posting resources to help engage agencies.

PRESENTATION: TSMO WORKFORCE GUIDEBOOK

As mentioned in “Day 1 – Segment 1” above, the TSMO Workforce Guidebook was created from recommendations from the first Workforce Summit.

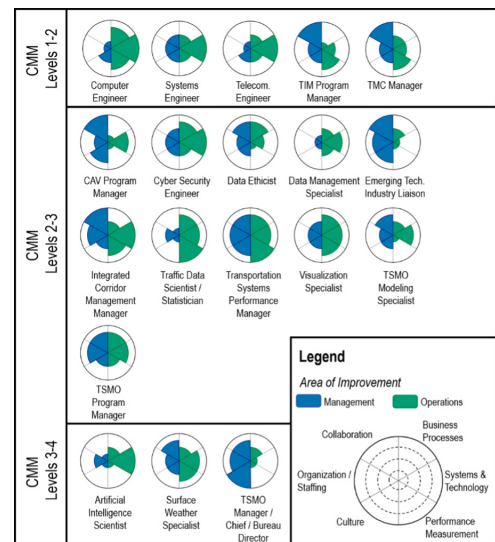
Todd Szymkowski provided an overview of the process of developing and the products developed as part of the NCHRP 20-7(408) that have subsequently been “deconstructed” and integrated into the NOCoE website.



The goal of the guidebook is to “assist you in creating meaningful TSMO-related positions that will help advance your organization’s maturity,” and the audience for the guidebook includes transportation agencies looking to begin or advance a TSMO program, people involved in recruiting and training for transportation operations positions, consultants, and college educators.

Several post-secondary positions and their accompanying descriptions were developed . The descriptions include job categories, minimum work history, applicability to different agencies, education, certifications and licensure, and KSAs.

Capability Maturity Matrix (CMM) improvement potential was explored in the guidebook. It was found that performance management shows great potential for CMM improvement, while collaboration shows a minor CMM improvement. The areas and level of improvement for new positions are shown in the graphic to the left. This information is useful in making a business case; many agencies may need to explain/prove how a new hire or a new position description will advance safe mobility.



Post-secondary educational programs include over 300 professional development or post-secondary trainings to-date; this resource will be kept up-to-date to include new opportunities. The Guidebook includes an analysis of educational opportunities and the gaps they present. Legal, procurement, and system security for TSMO are topics of study that have limited resources. Currently, all ABET accredited civil engineering programs are being reviewed and all relevant TSMO courses are being cataloged at undergraduate and graduate level. This resource will be included in the final deliverable.

The guidebook also covers the topic of retention. It lists several methods that can be used to improve employee retention, like good benefits packages, onboarding, leadership opportunities, and flexibility. It was found that good hiring and onboarding leads to better retention and stability of employees. Examples of good practices related to retention include:

- Delaware DOT justifies increasing salaries using routine market salary studies
- Ohio DOT broadcasts a weekly TV show targeting internal staff to show the great things going on at the organization
- Tennessee DOT conducts sponsored activities to engage a younger workforce
- Washington DOT allows some staff to have Central Office duties but work in the districts the majority of the time

After the presentation, the audience was asked: how have you or do you anticipate using the guidebook? The top result included using the guidebook to understand the workforce of the future (Figure 4).

¹ <https://transportationops.org/workforce/model-tsmo-position-descriptions>

GROUP DISCUSSION: HOW HAVE YOU OR DO YOU ANTICIPATE USING THE GUIDEBOOK?

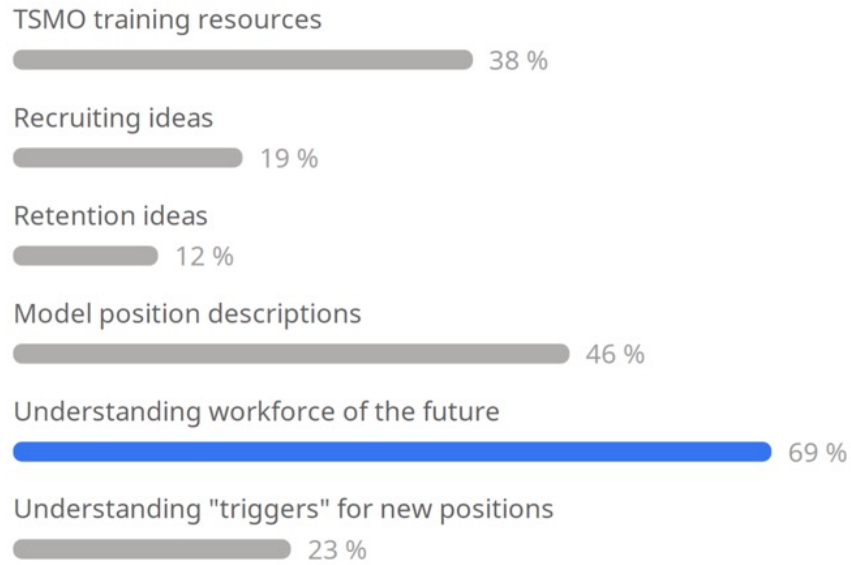


Figure 4. Poll: How have you used or how do you anticipate using the guidebook?

The group was also asked what types of professional positions were missing from the initial list of nineteen developed as part of the guidebook and the results include.

- Micromobility
- Project/contract managers with TSMO expertise
- Behavioral science - how people make transportation choices
- Cyber security analysts/engineers
- Data analyst
- Industrial engineering-whole system approach
- Energy specialists (ties to Smart Cities / communications)
- Non-motorized transportation experts
- Data scientists
- Systems engineers
- Business intelligence specialists
- Non-highway focused positions
- Intermodal specialists
- Wireless technicians
- Fiber optics
- TSMO solutions specialist
- Communication data analyst position
- Internet of Things (IoT)
- Communications
- BCA-economic analysis
- Electrification specialists
- Transportation planners
- TSMO marketing & communications
- Junior Engineers
- Telecommunications engineers
- Automotive/mechanical engineers
- Systems integrators
- Communications engineer

CASE STUDY 2: DEVELOPING THE PARAPROFESSIONAL TSMO WORKFORCE

Todd Szymkowski provided highlights of a white paper developed immediately after completion of the NCHRP 20-7(408) TSMO Guidebook project to start laying out issues around TSMO paraprofessional workforce development issues.

A TSMO paraprofessional is defined as 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.” There are currently two categories of TSMO paraprofessionals: TMC operation services and TSMO field operations.

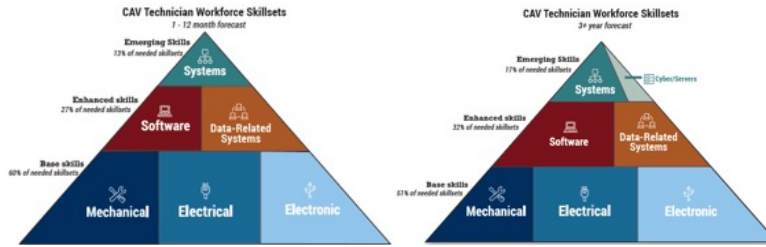
The TSMO Paraprofessional Workforce Development White Paper² identifies a roadmap on efforts that NOCoE and partners should consider in advancing the TSMO paraprofessional workforce:

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.

There are numerous activities and efforts to support TSMO workforce development. For example, USDOT ITS JPO held a virtual community college workshop series, which broke participants into groups such as “Outreach and Recruitment” and “ITS Technician Job Market.” IMSA supports paraprofessional workforce activities by supporting numerous certificates and by providing training. Minnesota DOT, the Workforce Intelligence Network and the North/West Passage Pooled Fund Study have published reports that support advancement of paraprofessional workforce activities.

The University of Michigan conducted a study, Understanding the Middle-Skill Workforce in the Connected & Automated Vehicle Sector, which assessed the necessary skillsets for a CAV technician. It looked three skill levels: base, enhanced, and emerging. Comparing an extended 3+ year forecast to the immediate future, the need for enhanced and emerging skills grows, and cybersecurity becomes a needed skill.

²<https://transportationops.org/publications/white-paper-tsmo-paraprofessional-workforce-development>



Finally, NOCoE’s white paper estimates the number of TSMO paraprofessionals at 10,000-13,000. This is based on the number of TMCs in the US, an estimate of TSMO field technicians, and the number of safety service patrol drivers.

BREAKOUT: PARAPROFESSIONAL WORKFORCE DEVELOPMENT ISSUES

Participants were broken into three groups and used Mural as an interactive white board to identify and discuss paraprofessional workforce development issues (Table 2).

Table 2. At the paraprofessional level, what issues are you facing related to workforce development?

	Recruiting	Hiring Process	Training & Capacity Building	Retention	Succession Planning
Group 1	<ul style="list-style-type: none"> • Need more non-traditional recruitment sources using non-traditional methods (AI, texting) • Lack of skills in employment pool • Need info on workforce metrics • Need to establish a pipeline • Need apprenticeships • Benefits are a major driver • Should partner with CTE programs 	<ul style="list-style-type: none"> • Need to train/certify workforce development representatives on TSMO • Streamline hiring process to compete with private sector • Hire with transferrable skills in mind • Need standard screening materials for TSMO-focused applicants 	<ul style="list-style-type: none"> • Need more CDL, TSMO, and standardized training • Cross-training will make jobs more appealing 	<ul style="list-style-type: none"> • Lack of career paths • Warehouses are major competition • Skill- and academics-based career ladders are needed more than time-in-positions ladders • Need more incentives to stay 	<ul style="list-style-type: none"> • Mentorships and reverse mentoring for management • There is no succession planning at paraprofessional level
Group 2	<ul style="list-style-type: none"> • Low unemployment • Apprenticeship needed • Cross-train high performers into TSMO paraprofessionals • With college becoming more popular, it’s hard to find middle skill people. Alternatively, people don’t want debt from 4-year program, they want portable credentials • Recruit from military, internal maintenance workers 	<ul style="list-style-type: none"> • Standard certification requirements instead of degrees • Industry needs to hire people lower than bachelor’s degree level • Rigid/old model of hiring no longer works 	<ul style="list-style-type: none"> • Need to reach vocational high school/associate level programs/people • Convert less-needed roles to TSMO positions (ex. make secretaries data analysts instead) • Revolving training program for training new hires into paraprofessionals • Potential negative impact of privatizing public tasks 	<ul style="list-style-type: none"> • Living wages and balance with good quality of life • People may see paraprofessional work as a steppingstone to other jobs • Keep people engaged while growing their talent via training 	<ul style="list-style-type: none"> • Rotational job programs can help with flexible workforce • Need for mentorship programs • Career pathways needed • Knowledge management program needed to combat loss of intellectual capital
Group 3	<ul style="list-style-type: none"> • Issue with finding people to recruit and platforms to recruit on • Varied skills needed for varied types of work • Issue with filling 2nd/3rd shift positions • Transitioning existing skillsets can be a hard change • Should be working with trade schools 	<ul style="list-style-type: none"> • Determining which skills are most transferrable is a challenge • Challenging trying to pull in consultants to DOT positions • New/wider skillsets are needed that don’t fit well under union or job classifications 	<ul style="list-style-type: none"> • Develop reference tools for staff to use • Should be using performance measures that encourage staff to try/learn new things • TMC operators under pressure • Joint training, flexible training, or even week-long TMC bootcamp are needed • Funding is needed for professional development 	<ul style="list-style-type: none"> • Compensation needs to be fair, inclusive of merit • Find out why people stay • Build relationships with key partners 	<ul style="list-style-type: none"> • Paraprofessionals often come from outside of the department, making succession planning hard • Share staff with partner organizations; co-op with high schools

Day 2 - Segment 3

INTRODUCTION FOR NEW PARTICIPANTS / DAY 1 HIGHLIGHTS REVIEW

Adam Hopps kicked off the day and provided some highlights from the first day. After roll call, Dr. Shawn Wilson, Secretary of Louisiana DOTD, and Jeff Paniati, Executive Director and CEO of ITE, provided welcoming comments. Dr. Wilson highlighted the critical role of operations in LA DOTD, especially in response to events that cause regional evacuations like hurricanes. Jeff Paniati discussed ITE’s role in supporting TSMO through the work its members play in sharing TSMO best practices through active participation in its councils, meetings, and training.

Thinking about [equity] in terms of our workforce, thinking about it in terms of how we deliver, thinking about it in terms of who we partner with and what opportunities exist for companies that might look different, think different, be different, or may have never worked with us is super important.
–Dr. Shawn Wilson

A review of the poll results from day one was shared with the group. An overview of positions to consider (beyond the TSMO Workforce Guidebook) were shared; they were created through a group discussion and are as follows:

- TSMO Marketing & Communications
- Automotive/Mechanical Engineers
- Systems Integrators
- Micromobility/Non-motorized/Non-Highway Trans. Specialists
- Behavioral Science - how people make transportation choices
- Energy / Electrification Specialists
- Economic Analysts
- Business Intelligence Specialists
- Intermodal Specialists
- Wireless Technicians
- Fiber Optic Technicians
- TSMO Solutions Specialist
- IoT Specialists

The issues identified on Day 1 of the summit were also reviewed (Table 3).

Table 3. Day 1 Highlights – Issues Related to TSMO Workforce Development

	Professionals	Paraprofessionals
Recruiting	Salary Competition, Awareness of TSMO, Tech outpacing positions	Limited pipelines to paraprofessionals
Hiring	Lengthy processes, Civil service requirements	Civil service process, sometimes interaction with unions can be challenging, Hiring for all shifts challenging
Training	Limited TSMO Training, Business Case from Industry to Academia needed	Public vs. Private sector training inconsistency, limited standardize training
Retention	Competition with other industries, other public agencies, consultants; Career paths for niche positions limited	24/7 operations vs. quality of life, Competition with other industries and other public agencies
Succession Planning	TSMO staff depth limits capture of institutional knowledge, senior management support for overlap of positions, limited rotation program compared to past	Almost non-existent at paraprofessional level, limited knowledge management systems designed to capture institutional knowledge

CASE STUDY 3: BEST PRACTICES IN WORKFORCE DEVELOPMENT FROM SIMILAR INDUSTRIES

Pat Noyes presented highlights of a case study that reviewed similar industries for best practices that could potentially be translated into the TSMO space. The industries reviewed included water, information technology, accounting, and trucking.

Water Industry

In 2020, the EPA published America's Water Sector Workforce Initiative: A Call to Action to address workforce needs "vital to sustaining our critical water infrastructure investments." It identified a critical shortage of staff and a large number of water sector workers eligible to retire in the next five to ten years. The Workforce Initiative focuses on the declining water sector workforce, its impact on public drinking water and wastewater systems, and the challenges that arise from aging infrastructure and increasingly complex systems and technologies. Similar to TSMO, this industry uses increasingly sophisticated information management systems to monitor water quality, treat and process drinking and waste water, and manage operations and assets. This requires a workforce with strong information management and cybersecurity skills. It also requires knowledge of new treatment technologies and advanced and emerging processes that support long term sustainability and resilience.

Information Technology

Information technology (IT) is closely related to many of the functions and technologies in the TSMO arena. For this reason, a number of challenges, needs, and skills are similar, allowing IT workforce practices to align with TSMO. The CIO Council, a forum of federal Chief Information Officers (CIOs) published the Future of the Federal IT Workforce Update in 2020, which looks at primary issue areas and drivers of the future. The report considers recruiting and hiring, retaining and reskilling, and augmenting the federal workforce. In addition to key findings in each of these areas, the report makes recommendations specific to actions that could be taken to support the federal IT workforce.

Accounting

The American Institute of Certified Public Accountants (AICPA) National Commission on Diversity and Inclusion published a Recruitment and Retention Toolkit to support the development of a more diverse and inclusive workforce in the accounting industry. The toolkit is intended "to help leaders understand how recruiting and retaining a diverse workforce can help them better achieve their companies' overall talent recruitment and retention goals...[and] how to integrate diversity recruiting and retention techniques into broader day-to-day business and personal activities." It addresses the importance of diversity in the profession and provides tools for creating a culture and actions to attract, recruit, and retain a diverse workforce. It presents the importance of leadership support for the value of diversity. The document builds on recruiting plans, training recruiters on the value of diversity, developing effective job descriptions and postings, enlisting current employees as recruiters, practicing targeted recruiting, creating a consistent interview experience for all candidates, and investing in onboarding. In the area of retention, the toolkit looks at organization-wide diversity and inclusion training, fostering an inclusive environment, investing in employee performance and development, conducting "stay interviews" in addition to exit interviews, and measuring ongoing progress. The report includes steps for building an effective mentoring program, combatting unconscious bias, turning employees into inclusion champions, and cultivating candidates that may not be actively looking for a new position. AICP has created additional

resources for advancing diversity and inclusion, available on their website. These include an Accounting Inclusion Maturity Model, webcasts, scholarships, and tools for women and other targeted groups.

Trucking

A recent article in Heavy Duty Trucking discussed a recent USDOT roundtable on the challenges of recruiting and retaining truck drivers. The Federal Motor Carrier Safety Administration (FMCSA) hosted the roundtable on July 8, 2021 with trucking stakeholders, attended by Transportation Secretary Buttigieg, Labor Secretary Walsh, and Deputy Administrator Joshi, to discuss workforce challenges and opportunities in the trucking industry. FMCSA noted that turnover rates for long-haul carriers is 90% and 72% for small carriers. This turnover creates a lag time from training and onboarding new drivers, resulting in driver shortages. The American Trucking Association (ATA) noted that the median age of current drivers is well above the national average age of all workers, creating a high rate of potential attrition. Recruiting a younger and more diverse workforce means making trucking a more attractive career choice. Registered apprenticeships which offer on-the-job training with wage progression has been an effective tool for retention. Wages are also a critical factor in retention and signing bonuses are being used to compete for skilled drivers. Federal support to state departments of motor vehicles is helping to address backlogs in issuing commercial drivers' licenses and return issuance rates to pre-pandemic levels. The Heavy Duty Towing article, Retention Practices: Align with Shippers That Care About Your Drivers, June 2021, suggests that beyond implementing in-house practices to keep drivers feeling valued and appreciated, it is important to look at how clients and shippers treat drivers. An example shipper practice that shows respect to drivers is to provide easy access to all-gender restrooms. Other best practices for driver retention include creating an open-door policy, giving drivers a say in fleet investments, and mentorship programs. A 2018 article in FleetOwner states that the keys to recruiting drivers are money, lifestyle, and respect. A 2021 article in Logistics confirms the importance of the issues in driver retention. The research looked at compensation, management quality, equipment quality, wait time requirements, and home time. It found the keys to retention lie in driver respect, proper supervision, good equipment, time at home, and sufficient compensation.

Takeaways

The main recruiting takeaways from assessing the industries above are to promote a sense of purpose and social good, and to foster cooperation between TSMO and human resource professionals. The retention takeaways are fostering career mobility, a culture of innovation, and flexibility in work environments. For diversity, equity, and inclusion, key takeaways are to build a culture of diversity and inclusion, create apprentice, mentoring, and/or sponsorship programs, participate in targeted outreach and recruiting, and collaborate with underrepresented groups.

GROUP DISCUSSION: WORKFORCE DEVELOPMENT PRACTICES FROM OTHER INDUSTRIES

The group was asked what types of workforce development practices from other industries were noteworthy or admirable. Results of the survey and follow-up discussion include:

- Make sure jobs are “as advertised”
- Focus on workplace climate and culture
- Detailed onboarding training for new hires at all levels
- Regularly reassess PDs and roles to adjust to changing needs
- Educational advancement opportunities
- Account for value of time
- Team Building activities
- Proactive collaboration with universities, especially HBCUs
- Focus work - sometimes public sector loads employees with many “other” duties
- Apprenticeships/internships
- Not sure this is now present, but NASA used to have an environment of competition, but reward and promotion from within
- Defined career paths
- Up skilling/cross training current workers
- Workforce training for all
- Time and funding for Professional Development
- Targeting non-traditional sources
- Promote meaning and purpose for the work
- Leverage people interested in a second career
- Workplace flexibility
- Creating collaborations with professional development organizations (i.e., WTS)
- Stay interviews - can make adjustments before they leave
- Flexible work schedules
- Performance based
- Leadership development
- Universities allowing their employees to take classes at no cost
- Targeted outreach to and support of veterans
- Performance based review
- TSMO

PRESENTATIONS: CLOSING GAPS IN TSMO WORKFORCE DEVELOPMENT ACTIVITIES

Three speakers offered perspectives how innovative strategies can help close the gaps on known workforce development issues:

- Academic Perspective on Workforce Culture – Dr. Stephanie Ivey
- Michigan DOT – Amber Thelen, Office of Organization Development
- Tennessee DOT – Kasey Vatter, Assistant Director of Learning & Development

Academic Perspective on Workforce Development

The gaps in TSMO workforce development activities include career awareness, training and education pathways, and career development. While lots of focus is given to post-secondary education, incorporating TSMO into K-12 education is important as well. By starting the education process earlier, career awareness can be improved and students can get involved in pre-apprenticeships and internships earlier. From the post-secondary perspective, experiential and service learning, apprenticeships, internships, and mentoring can give students a realistic sampling of what it’s like to work in a TSMO-related position. In both K-12 and post-secondary scenarios, the most important element is collaboration.

Michigan DOT

The declining birthrate is a gap that will impact the workforce long-term. Different generations in the workplace should be looked at differently as far as how to reach and interface with them, but generational differences can be both a gap and an opportunity. The workforce should be the responsibility of everyone in the department. MDOT's solutions to many gaps are presented based on their agency's foundational pillars.

Workforce and Succession Planning System (aka the MDOT House) – It's important to define soft skills and standards of every employee. These are incorporated into every level of the employee life cycle. Agencies need to learn to be more proactive than reactive and should use data to see what's coming in the future.

Knowledge Management System – With the steady flow of employees in and out of the system, MDOT establishes communities of learning to share knowledge and teach each other. A TSMO community of learning has been created at MDOT.

Lessons Learned on Employee Lifecycles – Pipeline programs work, and talent pipeline management is important. MDOT has 7 established pipelines and plans to create additional pathways. By bringing students in early, connections can be created across pathways. Get creative with recruiting to reach people that wouldn't find these positions on their own. Creating a culture around workforce is a key to success - "culture eats strategy for breakfast." There's a need for TSMO workforce planning.

Learning and Development – Creating a learning culture where growth is valued is also a great retention tool. 504(e) funding is a great resource to take advantage of.

Tennessee DOT

Tennessee Reconnect and Drive to 55 are two initiatives by the state of Tennessee to increase the number of people with degrees or technical credentials. Internal to the DOT, TDOT Reconnect is a continuing education program for TDOT employees who haven't completed a postsecondary education program. TDOT hopes that this program will provide opportunities for advancement and help people develop transportation-related skills. The program gives a comprehensive look at transportation skills and includes math, business writing, and computer skills. Upon completion of TDOT Reconnect, employees receive a 5% salary increase. So far, there have been 215 Reconnect participants statewide.

Future considerations for the program include:

- Scalability
- Sustainability
- Access
- Hybrid vs. classroom models
- Overall program evaluation
- Consistent articulation opportunities

BREAK-OUT: IDEA GENERATION

Each group spent time reflecting on the workforce development issues identified during Day 1. Each group then developed workforce development ideas including anticipated outcomes across five categories:

- Building and Sustaining TSMO Pipelines
- Services and Products
- New Models
- Research Needed
- Other

Results of the break-out exercise are shown in Table 4.

Results of the break-out exercise are shown in Table 4.

Category	Group 1		Group 2		Group 3	
	Idea	Outcome	Idea	Outcome	Idea	Outcome
Sustaining and Building TSMO Talent Pipeline	•Robust student chapter associations	•Career exposure and professional network	•Create module on TSMO/advanced transportation for high school physics teachers; explore branding campaign for TSMO careers	•Make potential job candidates more aware of what TSMO is and what careers are available	•Create a new university degree for a traffic operation engineer	•Employees with more appropriate skillset
	•Military pipeline is key	•Another supply to tap with core skills already in place	•Clearly define career paths for TSMO (within agencies, from HS through post-secondary, etc.); teach undergrad engineering students what TSMO is	•Provides clear picture demonstrating that leaving TSMO not necessary to advance	•Partner with youth groups to offer activities focused on TSMO, STEM, and transportation	• Young people engaging in educational program after high school
	•More apprenticeships	•More people aligned with TSMO	•Explore TSMO program in secondary education similar to TRAC bridge building program	•This will generate excitement for the operations facet of civil engineering	•Increase opportunities (e.g., working in a TMC) for internships and give course credit for them	• Make students more aware of TSMO career options; gives them a chance to try it out
	•More partnerships with tech schools	•TSMO specific programs that could include certifications	•Internships for undergrad engineering students			
	•Using 504e funding	•Investing in your people to benefit retention and recruitment				
Services or Products	•TSMO-focused leadership academy (beyond ROLF), similar to ITE's leadership course	•Equipped leaders of tomorrow in the TSMO community	•Succession plan	•Plan for folks leaving or retiring – loss of knowledge	•Co-op programs in high school	• More students interested in transportation

	Group 1		Group 2		Group 3	
	Idea	Outcome	Idea	Outcome	Idea	Outcome
Category	<ul style="list-style-type: none"> • Technical Training Resource Guidebook covering best practices; sharing best practices 	<ul style="list-style-type: none"> • Opportunities for others in the field 	<ul style="list-style-type: none"> • Scholarships for programs like Operations Academy 	<ul style="list-style-type: none"> • Easier access to resources that already exist 	<ul style="list-style-type: none"> • Trade school programs in transportation 	<ul style="list-style-type: none"> • More paraprofessionals in transportation
	<ul style="list-style-type: none"> • Course-based project partnerships 	<ul style="list-style-type: none"> • Exposure of multidisciplinary students to TSMO issues, solutions, and careers 	<ul style="list-style-type: none"> • Mentoring program that pairs senior to junior staff (shadowing) 	<ul style="list-style-type: none"> • Support succession planning 		
	<ul style="list-style-type: none"> • Course-based project partnerships 	<ul style="list-style-type: none"> • Exposure of multidisciplinary students to TSMO issues, solutions, and careers 	<ul style="list-style-type: none"> • Mentoring program that pairs senior to junior staff (shadowing) 	<ul style="list-style-type: none"> • Support succession planning 		
			<ul style="list-style-type: none"> • Expand federal veterans' programs; partner with DOD 	<ul style="list-style-type: none"> • Targets qualified veterans who are leaving now from reduced deployments 		
New Models	<ul style="list-style-type: none"> • Recruit first responders 	<ul style="list-style-type: none"> • Multifaceted workforce with existing safety knowledge 	<ul style="list-style-type: none"> • Retrain maintenance staff to become TSMO paraprofessionals. A great option as employees get older and seek ways to extend career 	<ul style="list-style-type: none"> • Attracts high performers from maintenance staff, provides career growth/change 	<ul style="list-style-type: none"> • Sponsor students to come to TSMO-related conference or peer exchange 	<ul style="list-style-type: none"> • Raises awareness of TSMO issues and the kinds of ways it makes quality of life better
	<ul style="list-style-type: none"> • Recruit new populations 	<ul style="list-style-type: none"> • Increased pipeline 	<ul style="list-style-type: none"> • Just like with reciprocal mutual aid between communities, develop models for shared TSMO staff 	<ul style="list-style-type: none"> • Shared staff may help with staffing levels, especially in small communities and rural areas 	<ul style="list-style-type: none"> • Tools for career services – how to translate your degree into a job 	<ul style="list-style-type: none"> • Capture college students when they are looking for a job How to transition. Career Services can offer connections to how to apply and accentuate your degree to meet an opportunity.
	<ul style="list-style-type: none"> • Break the job classification bottleneck 	<ul style="list-style-type: none"> • Sometimes the supply is there, but the barriers to 			<ul style="list-style-type: none"> • Make the connection to data science programs and draw them to 	<ul style="list-style-type: none"> • Draw new perspectives, expand workforce, and gain needed

Category	Group 1		Group 2		Group 3	
	Idea	Outcome	Idea	Outcome	Idea	Outcome
Category		Hiring are insurmountable			TSMO as the way to apply skills	Skills including for analyzing impacts to equity
	• Job rotation programs	• Establishing TSMO as a formal agency discipline				
	• Student Design Units – going beyond road design and incorporating systems engineering, etc.	• Better equipped workforce				
Research Needed	• Research and development of pilot TSMO technician level programs for tech schools	• Independent from specific research question, prioritize student involvement in research	• Research on the motivators for various generations in the workplace	• Gives insight from recruitment, retention, cultural things we do for each generation in the workplace (specific to TSMO)	• NCHRP synthesis to estimate TSMO workforce numbers	• Better understanding of our industry
	• The case study about what other sectors are doing is important. There may be value in looking even further: energy, manufacturing, etc.	• More best practices to tap	• Create part-time opportunity positions or stay-at-home parents who could work remotely (data analysts, etc.)	• Very capable people could contribute as para-professionals for TSMO part-time in a remote environment	• Create a market study	• Academia can develop new programs
			• How will future TSMO KSA evolve with the march towards CAT/CAV implementation? Research could explore this evolution			
Other			• Explore viability of retention bonuses tied to a commitment of service	• Reward longevity in critical areas	• Shift focus of messaging – how TSMO makes quality of life better and facilitates opportunities	• Appeal to the public service motivation and making the world a better place
			• Recognition programs	• Helps with retention and recruitment	• Research how new majors have been justified in other areas	• Provides a model for adaption in TSMO
			• Review any opportunities for national TSMO internships / grants to build specific positions that have significant gaps	• National TSMO internships / grants will help close shortfalls in specific positions. Positions to focus the grants could be reassessed on a bi-annual basis		
			• Market TSMO as exciting and leverage the pride in public service	• Attract employees into an exciting facet of our industry and leverage people's pride in public service		

Day 2 - Segment 4

ORGANIZED LIST OF IDEAS AND BREAKOUT: PRIORITIZATION EXERCISE

Over break, the top ideas suggested were synthesized into 18 options to be prioritized. Each group had the same list of 18 options and were asked to vote 1 through 5, where 1 was the highest priority. Votes for each group were tallied using the following point scale and are shown in Table 5:

- Rank 1 = 5 points
- Rank 2 = 4 points
- Rank 3 = 3 points
- Rank 4 = 2 points
- Rank 5 = 1 points

Table 5. Prioritization Results

Idea	Priority Scoring		
	Group 1	Group 2	Group 3
Strengthen Pipelines (Military, Tech. Colleges, 1st Responders, HBCU, etc.)	24 (2)	30 (1-tied)	26 (1)
Increase TSMO Apprenticeships and Internships (college students)	33 (1)	30 (1-tied)	18 (3)
Best Practices Guide for TSMO Technical Training	9 (5)	4	4
Create a new University Program for TSMO	11 (3)	15 (5)	14 (4)
Synthesis Report on Existing Resources	No votes	8	3
Research Into where non-traditional workers could support TSMO	No votes	9	3
Guidance on succession planning, retention, youngers workers, etc.	6	16 (4)	5
Leverage existing programs with additional funding	5	21 (2)	6
Deeper research into similar industries	No votes	2	No votes
Additional scholarships to Ops Academy	No votes	No votes	No votes
Addition College Scholarships (e.g., Eisenhower for TSMO)	No votes	4	No votes
National level internships for TSMO	No votes	No votes	1
Develop Business Case for Academia to focus more on TSMO	10 (4)	6	8
Synthesis Report to develop better workforce numbers for TSMO	5	No votes	No votes
More high school co-op programs	3	11	7
Resources highlighting TSMO as career of choice	4	20 (3)	24 (2)
Convene National TSMO Workforce working group	3	4	5
Leverage existing vocational education to include TSMO	No votes	8	10 (5)

GROUP DISCUSSION: CONCURRENCE ON TSMO WORKFORCE DEVELOPMENT PRIORITIES

Based on votes from the prioritization exercise, the following ten ideas advanced:

- Strengthen Pipelines (military, tech. colleges, 1st responders, HBCU)
- Increase TSMO Apprenticeships and Co-ops (for college students)
- Develop Business Case for Academia to focus more on TSMO
- Guidance on Succession Planning, Retention, Younger Workers, etc.
- Resources highlighting TSMO as Career of Choice
- Best Practices Guide for TSMO Technical Training
- Research into where Non-traditional Workers could support TSMO
- Create a New University Program for TSMO
- Leverage existing Vocational Technical Education Programming to include TSMO
- Leverage Existing Programs with additional Funding and Promotion

Collectively the group discussed the relative feasibility and importance of each idea. Results of the discussion are shown in Figure 5.

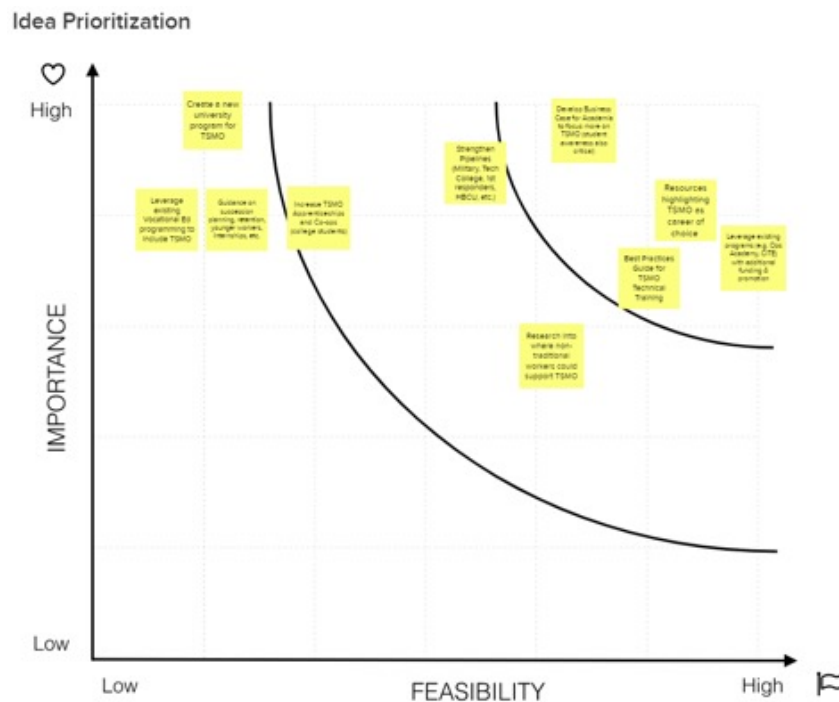


Figure 5. Idea Prioritization – Feasibility vs. Importance

GROUP DISCUSSION: POTENTIAL HIGH PRIORITY STRATEGY CHAMPIONS AND RESOURCES

The entire group was invited to offer potential champions and resources. The numbering is based on the ideas that have the highest importance and feasibility (upper right hand side of Figure 1 graphic).

Table 5. Prioritization Outcome and Potential Champions and Resources

High Priority Ideas	Potential Champions		Potential Resources
1. Develop Resources highlighting TSMO as Career of Choice	NNTW Marketing firm FHWA NOCoE	NACTO AASHTO AMPO ITE	National Transportation Career Pathways Initiative ITE Student Chapters
2. Develop Business Case for Academia to focus more on TSMO	NOCoE ITS PCB ITE Education Council	FHWA Ops FHWA OIPD	NOCoE (and its Case Studies)
3. Leverage Existing Programs with additional Funding and Promotion	AASHTO FHWA University of Maryland	UTCs ITE	Existing Operations Academy CITE Curriculum FHWA Every Day Counts Program NHI
4. Best Practices Guide for TSMO Technical Training	NOCoE NCHRP	AASHTO AMPO	Community Colleges/Technical Schools University Transportation Centers
5. Strengthen Pipelines (military, tech, colleges, 1st responders, HBCU, etc.)	Department of Defense First Responder Associations	NAPO NACoP AMPO, NLC	MDOT's Veteran Internship Program MDOT Transportation Diversity Recruitment Program
6. Perform Research into where Non-traditional Workers could support TSMO	UTCs NLC NACo	Community Colleges/Tech. Schools	
7. Increase TSMO Apprenticeships and Co-ops (for college students)	ITE AASHTO/State DOTs ITSA or ITS state chapters	NOCoE ACEC FHWA	University Career Centers ITE Career Center
8. Develop Guidance on Succession Planning, Retention, Younger Workers, etc.	ITE AASHTO HR Committee	TRB RTSMO AMPO	MDOT Pipeline Programs MDOT Workforce and Succession Planning System
9. Create a New University Program for TSMO	DOTs Consultant Community/ACEC ITE Education Council UTCs	FHWA Workforce Centers FHWA Operations NOCoE	
10. Leverage existing Vocational Technical Education Programming to include TSMO	California Dept. of Education's Career Technical Education	DOTs Industry Partner	NHI

WRAP-UP AND NEXT STEPS

Adam Hopps thanked the participants for their active engagement over the course of the two-day summit. The next steps following the TSMO Workforce Summit include:

1. Follow up with partners and FHWA to align actions with ongoing programs and assist in seeking to non-transportation specific partnerships.
2. Plan and conduct the Spring 2022 Workforce Peer Exchange, with a focus on practitioner activities and to more narrowly identify gaps between needs identified during the summit and ongoing activities within the industry.
3. Develop strategic implementation plan using the input gathered at the summit to inform NOCoE activities for the next five years.

Participants

Day One		Day Two	
Participant	Organization	Participant	Organization
Gary Euler	Consultant	Gary	Euler
Aaron Johnson	Michigan DOT	Aaron Johnson	Michigan DOT
Abbas Mohaddes	Econolite	Adam Hopps	AASHTO
Adam Hopps	AASHTO/NOCoe	Amber Thelen	Michigan DOT
Amber Thelen	Michigan DOT	Andrew Berthaume	Volpe Center
Andrew Berthaume	Volpe Center	Beverly Kuhn	Texas A&M Trans. Institute
Bob Edelstein	AECOM	Bob Edelstein	AECOM
Brad Freeze	Tennessee DOT	Brad Freeze	Tennessee DOT
Brian Brown	Ohio DOT	Brian Brown	Ohio DOT
Carlos Alban	ITS America	Carlos Alban	ITS America
Charity Coleman	Volpe Center	Charity Coleman	Volpe Center
Charles Yorks	Gannett Fleming	Charles Yorks	Gannett Fleming
Cheryl Lowrance	Noblis	Cheryl Lowrance	Noblis
Chris Bischak	Noblis	Chris Bischak	Noblis
David Jackson	ITS PCB / Volpe	David Jackson	ITS PCB / Volpe
Dongho Chang	Washington DOT	Doug Tomlinson	Pennsylvania DOT
Doug Tomlinson	Pennsylvania	Emily Lawless	Volpe Center
Michelle Mueller	Washtenaw Comm. College	Eric Rensel	Gannett Fleming
Eric Rensel	Gannett Fleming	Gary Euler	Consultant
Glenn McRae	University of Vermont	Glenn McRae	University of Vermont
Gummada Murthy	AASHTO	Gummada Murthy	AASHTO
Henry Schoenhoff	Volpe Center	Henry Schoenhoff	Volpe Center
Ilgin Guler	Penn State University	Ilgin Guler	Penn State University

Day One		Day Two	
Participant	Organization	Participant	Organization
Jeff Lindley	ITE	Jeff Lindley	ITE
Jennifer Toth	Maricopa County (AZ)	Jeff Paniati	ITE
Jim Tymon	AASHTO	Jennifer Toth	Maricopa County (AZ)
John Davis	City of Des Moines	John Davis	City of Des Moines
John MacAdam	Ohio DOT	Karen Bobo	FHWA
Karen Bobo	FHWA	Kasey Vatter	Tennessee DOT
Kathleen Frankle	University of Maryland	Kathleen Frankle	University of Maryland
King Gee	AASHTO	King Gee	AASHTO
Les Jacobson	WSP	Les Jacobson	WSP
Lloyd MacAdam	Ohio DOT	Marshall Elizer	Washington DOT
Nicole Majeski	Delaware DOT	Martin Pietrucha	Penn State University
Marshall Elizer	Washington DOT	Mohammed Hadi	Florida International University
Martin Knopp	FHWA	Natalie Bettger	North Central COG
Martin Pietrucha	Penn State University	Neeka Mahdavi	Volpe Center
Mohammed Hadi	Florida International University	Niloo Parvinashtiani	ITE
Natalie Bettger	North Central Texas GOG	Pat Noyes	Pat Noyes & Associates
Neeka Mahdavi	Volpe Center	Pat Zelinski	AASHTO
Niloo Parvinashtiani	ITE	Sarah Abel	ITE
Pat Noyes	Pat Noyes & Associates	Scott Gilman	Volpe Center
Pat Zelinski	AASHTO	Scott Marler	Iowa DOT
Robert Bertini	Oregon State University	Shawn Wilson	Louisiana DOTD
Scott Marler	Iowa DOT	Stephanie Ivey	University of Memphis
Shawn Wilson	Louisiana DOTD	Steve Lockwood	Lockwood Consulting
Stephanie Ivey	University of Memphis	Susan Gallagher	Western Transportation Institute

Day One		Day Two	
Participant	Organization	Participant	Organization
Steve Lockwood	Lockwood Consulting	Tara Reel	Volpe Center
Steve Panton	Gannett Fleming	Todd Szymkowski	Gannett Fleming
Susan Gallagher	Western Transportation Institute	Tom Kern	NOCoE
Tara Reel	Volpe Center	Tony Kratofil	Michigan DOT
Todd Szymkowski	Gannett Fleming	Tracy Scriba	FHWA
Tom Kern	NOCoE	Travis Lutman	North Dakota DOT
Tony Kratofil	Michigan DOT	Vasilisa Yakumithis	Gannett Fleming
Tracy Larkin Thomason	ITS America		
Tracy Scriba	FHWA		
Travis Lutman	North Dakota DOT		
Valerie Briggs	FHWA		
Vasilisa Yakumithis	Gannett Fleming		
Victoria Sheehan	New Hampshire DOT		
Vishal Kakkad	Manatee County (FL)		