Aligning Transportation Management Center Staffing Capabilities for the Future of Systems Operations

Transportation Management Center (TMC) Pooled-Fund Study

Federal Highway Administration (FHWA)

April 2024

U.S. Department of Transportation
Federal Highway Administration

Presentation Outline

Overview

Aligning TMC Staff with Current and Future Agency Needs and Capabilities

Potential Future TMS Enhancements:

- New or enhanced system operations strategies.
- New, improved, or expanded functions, services, or areas of coverage (e.g., integrated corridor management, active traffic management, adaptive system operations, active work zone operations, etc.).
- New technologies and improved system capabilities and changing needs for maintenance and repairs.
- Increased expectations for analysis, performance reporting, and data management.

Agency Considerations:

- Assessing staff numbers, skill sets, and technical capabilities.
- Quantifying and determining skills and requirements.
- Acquiring the right staff.
- Recruiting, retaining, and developing staff.
- Aligning compensation and roles with technical needs.

Examples of New or Specialized Roles in TMCs

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- Information or data analyst, business analyst.
- Data scientist and data management specialists.
- Traffic analyst.
- Meteorologist.
- Traffic incident management coordinator, Safety Service Patrol—Dispatcher and coordinator.
- Work zone monitor and coordinator.
- Telecommunications and information technology specialist.
- TMC instructor.
- Engineer or engineering technician.
- Corridor manager.
- Computer and systems engineer.
- Cybersecurity specialist.

Potential Staffing Needs To Improve TMC Performance

Technical Needs

- Software.
- System networking and sharing data.
- Hardware.
- Telecommunications.
- Emerging technologies.
- Data management.
- Electrical engineering.
- Traffic engineering.

Business and Operations Needs

- Follow standard operating procedures (SOPs).
- Collaborate with multiple agencies.
- Use multiple operating systems.
- Implement and monitor traffic operations strategies.
- Analyze data and performance.
- Troubleshoot equipment and systems.
- Train and develop staff.

Acquiring Staff for the TMC

Staffing Approach	Characteristics
Public Sector Staff	Agency employees fill roles for operations, management, staff supervision, and project and program management.
Contractor Staffing	• Agencies establish contracts with private sector firms to support operations, staff management, or maintenance. Additionally, contractors may fulfill roles for traveler information, incident response, data analysis, and other functions. • Agencies may include multiple contractors for various roles.
Hybrid Approach	• Agencies utilize contractors for specific functions or services (such as device maintenance, system design, day-to-day operations, and express lanes operations). • Contracts may include oversight of contractor staff by agency staff.

TMS Influences on Staffing

Motivations for Needing Additional Staff at TMCs

- Changes in agency business rules and operating environment:
  - Limitations on full-time equivalent (FTE) staff numbers.
  - Funding considerations.
- Challenges with staff recruitment and retention:
  - Difficult for public sector to attract and retain staff with the right technical skills.
  - Limited opportunities for career advancement.
  - Higher salaries in competing industries for people with skills TMCs need.
- Desire to improve TMS capabilities and performance.
- New, improved, or expanded functions, services, or areas of coverage.

Agency or Contracting Staff for TMCs

- Potential benefits of utilizing contracted staff:
  - Provides needed staff without counting toward agency FTEs.
  - Provides ability to expand or scale staff to meet needs.
  - Provides potential staff retention benefits (e.g., compensation, career paths, and staff development).
  - Offers supplemental staff for specific functions, such as maintenance, design, integration, and other services.
- Potential benefits of utilizing agency staff:
  - Allows agency to retain knowledge and operational responsibilities.
  - Keeps decisionmaking for operations in-house.
  - Provides integration with other agency functions and access to internal agency resources.
  - Enables cross-training and utilization across other group or agency functions.

Challenges With Assessing TMC Staffing Needs

- Quantifying needed knowledge, skills, and abilities (KSA).
- Developing, operating, and maintaining TMSs with staff members who have specific technical expertise, knowledge, and skills.
- Having limited training resources available to staff in TMCs beyond on-the-job training.
- Modifying staff roles, responsibilities, job descriptions, staffing levels, or support resources.
- Aligning the different types of knowledge, skills, and resources that may be needed to support TMSs compared to typical agency positions.
- Expanding staff members' capabilities to proactively manage and operate a TMS.
- Adding staff with the capabilities needed to support the next generation of the agencies' TMS.

Evaluating Impacts of TMSs on TMC Staffing

- What are the staffing and resource needs of the TMS?
- Are adequate numbers of staff members available to manage and operate the TMS?
- Do current staff members have the needed technical KSA? Are there specialized skills needed that do not exist with current staff?
- Is training available? If not, how can staff members acquire the needed knowledge, skills, and technical capabilities?
- Will the addition of new operations strategies, functions, or services require staff members to perform differently? Are the needed staff and resources available?
- Are new technologies, capabilities, or systems that may require new processes or skills to manage, operate, or maintain the TMS being implemented ?
- How might agencies support staff with preparing for new TMS capabilities?
- Can specific reasons for staff turnover be identified? Can the number of potential turnovers be mitigated?

Staffing Issues To Consider for TMSs

- Being aware of the roles and responsibilities for monitoring, managing, or verifying the status of subsystems, components, or devices.
- Having the ability to troubleshoot malfunctions to prevent unnecessary maintenance, equipment downtime, or repairs.
- Being aware of distinctions between automated and manual operations or actions to assist staff with understanding when a manual intervention may be needed.
- Documenting SOPs for functions, actions, or services to promote consistency and understanding among staff.
- Understanding how different subsystems, components, or devices may support operational strategies and improve staff decisionmaking.
- Establishing authority levels to implement or adjust different operational strategies or response actions to align staff with appropriate experience and expertise.

TMS Staffing Plans

Opportunities for Identifying TMC Staffing Needs as Part of Planning for Future TMS Improvements

- System Planning and Concept of Operations:
  - TMC use cases—User needs, TMC workflows.
  - TMS components that TMC staff must interact with or operate.
  - TMS perspectives—Traveler information, incident monitoring and response, traffic management.
- System Requirements:
  - Understand TMC roles and needs to address requirements.
  - Identify areas for training, new knowledge requirements, or processes.
- Capability Maturity Model Assessments:(1)
  - Organization and Staffing dimension provides the most direct input to needs for workforce, staffing, technical skills, and training.
  - Other dimensions (Business Processes, Systems and Technology, Performance Measurement, and Culture and Collaboration) provide additional staffing needs.
  - Capability Maturity Framework dimension serves as an additional tool.

KSA for TMC Staff

- **Knowledge** is defined as the intellectual possession and command of information necessary to qualify for the position (entry level) and the information to be acquired after assuming a position to perform the required tasks. The knowledge of a TMC staff member or candidate may be assessed by measuring the accuracy of responses to a set of TMC operations-related questions.(2)
- **Skill** is defined by an assessment of the level of proficiency in exercising knowledge and performing TMC tasks. Skills are typically assessed by task performance time and accuracy assessments.(2)
- **Ability** is defined as the basic intellectual and physical capacities necessary to successfully perform in a TMC operations position, acquire the necessary skills, and apply the necessary knowledge. The ability of a TMC staff member or position candidate may be assessed by aptitude tests or may be assumed based on level of education and job history.(2)

Developing KSAs for TMS Staff

Sample Function	Sample Corresponding Action[3]	Sample Requirement[3]
Detect traffic incidents on the freeway	• Receive system alerts of abnormal conditions. • Confirm incident location with closed-circuit television cameras. • Monitor updates from public safety agencies.	• Use TMS tools to detect incidents (alerts, visual monitoring systems). • Use TMS tools to verify incidents (alerts, visual monitoring systems).
Coordinate response to incidents	• Enter confirmed incident into lane closure database. • Determine response needs from agency. • Dispatch safety service patrol. • Receive updates from safety service patrol and responders. • Respond to questions and requests.	• Use lane closure system. • Coordinate with internal resources for response. • Coordinate with external resources for updates and support needs. • Actively monitor incident scene with TMS tools.
Share incident information with agencies and travelers	• Update details of incident response in lane closure database. • Activate dynamic message sign appropriate message from library. • Notify affected agencies (local agencies, other responders). • Monitor social media alerts. • Confirm 511 and other agency traveler information systems have issued alerts.	• Use TMS to provide en route traveler information. • Use and monitor public-facing tools. • Update systems that support external information sharing.

Using Contracted Staff for TMCs

- Benefits:
  - Allocate FTE staff across agency operations.
  - Define job roles and classifications as well as pay scales.
  - Enhance contractor responsibility for hiring process, scaling up resources in emergencies or to cover during vacations and absences, and implementing strategies for staff retention.
  - Increase opportunity for employee advancement.
  - Extend incentives and recognition provided (something not allowed in public agencies).
  - Extend and expand training opportunities.
- Challenges:
  - Experience tradeoffs with contract duration.
  - Add to contract scope and fee with changes.
  - Have gap or void of knowledge for agency.
  - Involve transition periods between contractors.
  - Align contract type and payment method needed to consistently achieve operating expectations.
  - Require agency staff with required skill set and authority to manage and evaluate contractor performance.
  - Define contractor performance expectations and thresholds.

Using Agency Staff for TMCs

- Benefits:
  - Understanding broader agency missions and functions.
  - Understanding agency organization.
  - Having access to internal agency resources, publications, processes.
  - Being eligible for retirement and benefits offered to State or public sector employees.
  - Retaining institutional knowledge, expertise, and lessons learned.
  - Facilitating integration among agency TMC staff.
  - Acquiring incentivized tenure and long-term employment from civil service benefits.
- Challenges:
  - Administrative rules may apply that can slow advancement within organization.
  - Operational budgets and hiring processes may make quickly expanding staff challenging.
  - Agency compensation limitations can make attracting qualified candidates challenging.
  - Career growth can be limited within public agencies or within TMCs.

Benefits of Staffing Plans for TMCs

- Aligns with current and future needs of the TMS.
- Identifies where future operational strategies will influence staffing.
- Supports agency resource planning, considering the timeline for system and operating enhancements.
- Provides a business case for additional resources or realignment of current resources.
- Identifies gaps in current staffing numbers or skill sets, and identifies new roles or functions needed.
- Captures methods to acquire staff, adjust TMC staffing approach, and provide additional training.

Components of a TMC Staffing Plan

- Current TMC functions, operations, hours, shifts, and organization.
- Current TMC staff roles or responsibilities and gaps.
- Operational influences (e.g., new systems, new operating strategies, and expanded TMC roles or functions).
- Future organization and staffing needs.
- Process to acquire needed TMC staff resources.
- Training needs—Internal (agency), technical, and cross-training opportunities.
- Implementation timeline. (When is new staff or training needed?)
- Process for reviewing or updating the plan.

TMS Staff Development

Challenges With Defining New TMC Roles

- Creating job descriptions and roles.
- Quantifying specific staff technical needs for future systems.
- Knowing what general and specific knowledge areas are needed:
  - Understanding how actions to be performed translate to specific requirements.
  - Determining how TMC staff will interact with and use TMS components and systems.
  - Identifying decisionmaking needs and requirements to support those decisions (i.e., engineering judgment).
- Aligning with human resource (HR) requirements:
  - Differentiating between “required” versus “desired” experience, qualifications, and education.
  - Establishing compensation and classification scales.
  - Creating recruiting strategies and maintaining a pool of potential candidates.
  - Obtaining a broader perspective on comparable roles within an agency.

Acquiring Staff To Support TMS Operations at the TMC

- In-house agency staff:
  - Work with HR to develop job descriptions and roles.
  - Leverage TMC staffing plan for KSAs and specific staff needs.
  - Recruit through agency HR processes.
  - Implement onboarding, training, and integratione of staff members into TMC operations.
  - Establish processes for staff development, ongoing training, and career progression.
- Contracted staff:
  - Identify TMC functions (partial or full operations) where supplemental staff are needed.
  - Develop procurement, advertisements, and contractor selection.
  - Outline requirements for selected contractor:
    - Performance expectations.
    - Staff expectations.
    - Roles, responsibilities, and lines of communications.
    - Compensation.
  - Monitor contractor performance.
  - Update or modify contract, if needed over time.

Types of Contracts

Contract Type	Advantages[3]	Challenges[3]
Time and Materials	• Lower risk for contractors. • Ability to be reimbursed for authorized changes and adjustments.	• Requires contractor effort to track and report. • Consists of variable costs. • Requires balance of escalating labor costs versus negotiated billing rates.
Performance Based	• Incentives for achieving performance thresholds. • Flexibility for contractors in how they achieve performance expectations.	• Requires clearly defined expectations and criteria. • Can be challenging to define how contractors will be evaluated and measured.
Fixed Price	Risk is on the contractor to deliver within the established budget.	• Requires well-defined scope. • Requires contractor to build risk into costs or rates. • Offers limited flexibility in expanding scope or resources.
Cost-Plus Fixed Fee	• Ability for cost reimbursement with negotiated fee. • Less risk to agency for unaccounted costs. • Relatively low risk to contractor and limited need to build in risk. • Incentivizes the use of high-quality staff.	• Requires clear identification of what costs are reimbursable. • Requires periodic monitoring for adjustments.

TMC Staffing Contractor Expectations

- Recruit and hire qualified staff.
- Supervise staff and operations.
- Identify additional skills or expertise needed to support TMS operations.
- Provide training to staff; verify staff proficiency with TMS operations and systems.
- Implement processes to retain and develop staff.
- Address staff performance and conduct issues.
- Track, monitor, and report on TMC staff and operations to agency per contract terms.
- Provide benefits and equipment (phones, vehicles), and implement processes for tracking and reporting time.
- Communicate and coordinate with contracting agency.

TMC Staff Recruiting and Development

- Candidate pools (TMC operations):
  - Military experience.
  - Engineering program credentials.
  - State and local law enforcement dispatch and public safety.
  - Considerations: Comfortable with maps, radio communications, operating systems, dispatch functions, and multitasking.
- Candidate pools (technology focused):
  - Agency may be competing with other industries for technical skills (electrical engineering, software, and telecommunications).
  - Agency pay scales and career path options may be limited.
- Creative approaches:
  - Advertise through social media.
  - Recruit through career fairs.
  - Reach out to universities, community colleges, and technical programs.

Staff Recruitment and Retention Considerations

- Recruitment:
  - Partner with technical and community colleges to develop a course that can help train potential candidates. The Delaware DOT (DelDOT) and the Washington State DOT (WSDOT) have such partnerships.[1,2]
  - Utilize staffing contractors who may have more flexibility in recruiting and targeting specific candidates for TMC roles.
  - Invest in training less skilled operators who are hired at entry-level positions.
- Retention:
  - Provide incentives for staff, such as performance bonuses, recognition, and performance-based pay increases.
  - Redefine TMC operator positions into different classifications. Utah DOT (UDOT) and Caltrans (California DOT) District 11 both reclassified TMC operations staff into a dispatch classification, which provided an increase in pay ranges and helped staff qualify for additional career levels within the dispatcher classification.[3,4]
  - Link advancement opportunities to performance-based milestones and have skill-based milestones to incentivize employees into wanting to achieve those incentives.

[1] Interview with DelDOT, February 2020.

[2] Interview with WSDOT, March 2020.

[3] Interview with UDOT, February 2020.

[4] Interview with Caltrans District 11, February 2020.

Staff Recruitment and Retention Challenges

- Lack of competitive salaries (agency and contractors).
- Competition with strong economy and job market (may require training the right candidate for entry-level roles).
- Undefined career paths:
  - Certification and license requirements may limit advancement to management roles.
  - Small teams may limit other advancement opportunities.
- Increased flexibility for contractors:
  - Recruiting practices.
  - Candidate screening and interviewing.
  - Training programs and resources beyond operating procedures.
  - Incentives—Performance bonuses, performance-based pay increases, additional career paths.

Resources

TMS Resources

- TMC PFS website.(4)
- National Operations Center of Excellence (NOCoE) TMS portal.(5)
- TMS staffing and operators resources.(6)
- Next generation of TMSs resources.(7)

TMS Staffing Resources

- TMC operator requirements and position descriptions.(2)
- Aligning Traffic Management Center Staffing Capabilities for the Future of Systems Operations.(3)
- Human factors design guidelines.(8)
- TMC staffing and scheduling for day-to-day operations.(9)
- HR resources.(10)

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Speaker's Notes

Speaker's Notes (1/35)

The TMC PFS is a group of public agencies and organizations who voluntarily pool funds each year and collaborate on projects to develop technical resources and advance activities to address the key challenges and issues they are collectively facing in support of improving performance, capabilities, and how they manage and operate their Traffic Management Systems (TMS) and Centers (TMC).

This presentation was developed as part of the TMC PFS project on Analysis of TMC Staff and Staffing Contracts.

Speaker's Notes (2/35)

This presentation includes five sections:

1. Overview
2. TMS Influences on Staffing
3. TMS Staffing Plans
4. TMS Staff Development
5. Resources

Speaker's Notes (3/35)

None.

Speaker's Notes (4/35)

As technology and practices continue to evolve, the next generation of an agency's TMS may introduce new technologies, new functions, increased system automation, enhanced analytics and decision-support capabilities. Existing or legacy TMSs might involve significant manual interventions (e.g., functions, services, tasks) by staff at the TMC to manage and operate TMSs. New services, functions, tasks, use of new operating strategies may also have important influences on staffing needs.

Aligning TMC staff with current and future agency Traffic Management System (TMS) needs as well as issues to be considered by agencies are the focus of this presentation.

Speaker's Notes (5/35)

- Some transportation agencies are implementing specialized roles that are staffed within the TMC or closely coordinated with TMC operations. These positions include the following:
- Information specialist, data analyst, business analyst—These roles acknowledge an emphasis on realtime performance monitoring and analysis for operating strategies such as ATM, ICM, managed lanes, and similar.
- Meteorologist—This dedicated meteorological specialist can interpret forecasts, align forecast information with realtime road condition information from TMS devices, and provide valuable coordination with TMC operations staff during weather events.
- Safety service patrol dispatch—This specialized training and dispatch staff will collaborate with service patrol during incident response and can relay realtime information to TMC operations staff to inform traffic management and traveler information needs. These positions may have additional coordination with incident responders, such as law enforcement, fire, and emergency medical services.
- Work zone coordinator—This position may have responsibility for actively monitoring work zones for safety and compliance with approved project traffic management plans and may coordinate with field crews, contractors, or agency resident engineers to adjust the work zone if needed.

Speaker's Notes (5/35) – continued (1/2)

- TIM specialist—This specialized resource may coordinate with incident command in the field during incidents; liaise with responder dispatch centers; and evaluate improvements or new TMS technology to support enhanced incident detection, monitoring, and response by the TMC.
- TMC training coordinator—This position may be responsible for developing and refining training materials and processes for different TMC positions and functions; providing consistent levels of training, particularly when multiple TMCs are involved; and reviewing and updating TMC training to align with TMC SOPs. Additionally, this position may identify where TMC staff can benefit from broader training on TSMO strategies and the methods and resources for providing that training.
- Telecommunications specialist—This position has specialized technical training and expertise in telecommunications systems for TMCs and TMSs, including different field communication technologies (such as fiber, wireless).
- IT—This position has technical expertise and knowledge in systems engineering, hardware, applications, and security of computers and networks. Some TMCs have a dedicated resource or team within the TMC with these capabilities; others rely on agency IT staff to support specific technical requirements.

Speaker's Notes (5/35) – continued (2/2)

- Engineer or engineering technician—A licensed engineer can provide guidance, recommend changes to operating strategies, or approve strategy changes for operational decisions that require engineering decisionmaking. This position is particularly relevant for more complex operating strategies, such as ATM, which can potentially include adaptive control systems, decision-support systems, variable speed limits, and other dynamic strategies.
- Corridor manager—This staff resource understands the bigger picture of corridor strategies and operating needs with adjacent state/local agencies and can take responsibility for identifying changes or improvements needed based on corridor performance. As agencies implement more robust corridor management strategies, this position will become increasingly important. With many functions for corridor operations and management spread across different entities within the TMC and within transportation agencies, a central point of responsibility can bring those different perspectives together to identify strategy improvements and needed staffing updates and changes to support those strategies.

Speaker's Notes (6/35)

To improve TMC performance, qualified and skilled staff are needed to address both technical and business/operation needs of a TMC that operates a TMS.

Speaker's Notes (7/35)

Transportation agencies typically follow one of three staffing approaches for TMC staff: in-house, contracted, or hybrid. There are benefits and challenges for each option. Agencies will need to determine what approach (or combination of approaches) will yield the most effective and advantageous method for providing the required staff to meet TMC and TMS operating needs.

Speaker's Notes (8/35)

None.

Speaker's Notes (9/35)

There are motivations that drive an agency's consideration of seeking additional staff:

- Budgets and funding sources
- Agency FTE restrictions or requirements
- TMC services provided
- Technical skill sets
- Staff turnover and retention

Speaker's Notes (10/35)

When an agency employs in-house staff for TMC operations, the agency is typically responsible for all aspects of staff recruiting, training, development, and retention. The staff is comprised of predominantly agency employees. Some professional services or tangential responsibilities can be supported by the private sector (such as design consultants, system vendors), but all day-to-day operational activities are owned and addressed by those agency employees.

When an agency employs contracted staff of private sector employees from either staffing contractors or consulting firms, the contracted staff provide professional services to support agency TMC operations. The level of detail within staffing contracts can vary, but mapping the contract to a high-level staffing plan that demonstrates the agency's vision and day-to-day objectives is crucial. In this approach, the detailed staffing plan is the responsibility of the contractor, with oversight from the agency. Additionally, contract mechanisms contain a balance of flexibility and clarity that support establishing an effective partnership between the agency and the selected contractor

Speaker's Notes (11/35)

- Quantifying needed skills for TMSs can be challenging. Without an understanding of the operating requirements, system interactions, or performance expectations, this creates a knowledge gap about an agency's technical needs for operating, managing, and maintaining TMSs.
- Developing, operating, and maintaining TMSs requires staff with specific technical expertise, knowledge, and skills. These could include software, communications, networking, hardware, and other skills that could represent Information Technology (IT), software development, system integration, electrical engineering, traffic engineering, and other specialties. There are internal agency challenges with Human Resources processes to identify the KSAs that may be required for different positions. Where these KSA's may support identifying position classifications, compensation, certification requirements, education, or experience requirements. Agencies may be competing with the private sector for specialized technical skills or may not be able to attract candidates that have the required technical training, certifications, or knowledge within public-sector salary ranges.
- There are limited training resources available to staff in the TMCs beyond on-the-job training. There is a lack of technical training resources available for operations staff at TMCs beyond standard operating procedures (SOP) and system documentation. Expanding TMS capabilities and functions requires training for TMC operations staff on new operating processes, performing operational analyses, or operations strategy implementation. Equipment vendors and TMS developers can provide training on the mechanics and steps of interacting with software and systems, and staff are challenged to focus on the "how" and the "why" for strategy implementation.

Speaker's Notes (11/35) - continued

- Agencies face challenges with modifying staff roles, job descriptions, increase staff, or support resources. For TMCs that rely primarily on agency staff for TMC operations roles, there could be internal challenges in redefining or reclassifying job descriptions to better align with TMS operating needs. Hiring additional staff or cross-training staff with the required operating skills might be limited due to caps on staff numbers, union restrictions, or other internal barriers. Contractor-provided staff can, in some ways, be more flexible with scaling numbers of staff as well as providing specific technical skill sets. Available budget within a contract for TMC staff can be a limiting factor for agencies (and contractors) to scale staffing levels.
- Ranges of skills and resources may be needed to support TMSs. There is a lot of emphasis on the technical capabilities needed to fully realize the benefits of more complex and sophisticated TMSs. Additional roles and functions, such as communicating with responders via radio, monitoring social media, sending emails to internal or external stakeholders, or compiling reports may not require unique skills and capabilities. Agencies need staff that can be effective with highly technical skills and tasks as well as routine tasks.
- The proactive management and operation of a TMS or the capabilities of the next generation of an agencies system may involve expanding upon current staff capabilities and resources. Transportation agencies shifting from TMC staff roles focused on monitoring and reacting to roles that actively manage transportation networks need strong leadership support and an agency culture that values performance-based operations and recognizes the complexities that TMC staff navigate because of robust system operating approaches.

Speaker's Notes (12/35)

Examples of the issues agencies may consider when evaluating the potential impacts or influences of TMSs on TMC staffing are presented on this slide.

Speaker's Notes (13/35)

The subsystems and components require processes to monitor, operate, manage, and maintain.

- If processes are not documented, this could lead to errors and inconsistencies.
- If the relationship between subsystems and components, or where components support multiple subsystems is not understood, the systems might not function in an integrated fashion.
- Lack of staff awareness of their roles and responsibilities for monitoring, managing, or verifying status of subsystems and components may lead to inconsistent processes for operating Traffic Management System (TMS) elements.
- If staff do not know how to troubleshoot malfunctions, it could result in unnecessary maintenance or equipment downtime.
- Training tools and resources and operating procedures to provide the necessary knowledge, skills, and methods to support staff in their interactions with TMS subsystems and components for optimum operations.
- Staff should be aware of performance expectations associated with each subsystem and component to identify performance issues.

Speaker's Notes (13/35) – continued (1/2)

Actions, functions or specific activities (tasks and combinations of tasks) to support an operational strategy.

- Documenting standard operating procedures (SOP) for functions and actions can promote consistency and understanding among staff.
- Awareness of distinctions between automated and manual actions may help staff to understand when manual intervention is needed.
- A documented architecture that shows connectivity for functions promotes a better understanding among staff of the relationship of actions on different operational strategies or plans.

Speaker's Notes (13/35) – continued (2/2)

Operational strategies combine functions, actions, subsystems, and components to deliver a desired mobility, safety, or reliability objective.

- Documenting agency goals for operational strategies promotes broader understanding of the relationship between Traffic Management Center (TMC) actions and resulting system operations.
- Understanding how different components and subsystems support operational strategies can improve operations decisionmaking by staff.
- Staff awareness of unique or specialized skills required to facilitate the operational strategy, and how staff can improve proficiency through training.
- If staff do not have these specialized skills, training and clear SOPs may provide the technical steps and knowledge for staff to use.
- Staff can provide context in developing, updating, and maintaining processes to support operational strategies through their daily interactions with TMS components, subsystems and procedures.
- Establishing authority levels to implement or adjust different operational strategies can align staff with appropriate technical expertise to make specific operations decisions.

Speaker's Notes (14/35)

None.

Speaker's Notes (15/35)

Agencies can gain valuable information about anticipated staffing roles, actions, and staff technical skill requirements from different TMS planning activities, particularly for staff at the TMC. Inputs from systems engineering processes such as the Concept of Operations or System Requirements can provide insights on roles, responsibilities, and staff interactions with various TMS components, subsystems, and functions.

In addition, the Capability Maturity Model (CMM) self-assessment tool is a tool that many transportation agencies are using to help identify capabilities, performance, and maturity of various operating processes.

Speaker's Notes (16/35)

There are distinct differences between entry level KSAs and advanced level KSAs:

- Entry level can include staff with little or no direct experience but will have basic abilities that indicate they can gain the skills and knowledge through training to complete required tasks in the TMC operating environment.
- Advanced level KSAs indicate that staff can perform required tasks with full proficiency, require minimal supervision or direction, or staff have a unique technical skill that addresses a specific TMC or TMS operating requirement. There may be additional expectations of staff to have specific education, training, or system knowledge that is included as part of advanced level KSAs.

Speaker's Notes (17/35)

The methodology for developing TMC staff KSAs that was presented in the Guidelines for TMC Transportation Management Operations Technician Staff Development can be adapted to current and future TMS operating requirements. Agencies can use this approach to begin developing requirements of the different positions that will be responsible for monitoring, operating, managing, and maintaining different elements of their TMS. The Functions and Actions serve as primary inputs to the operator requirements, including specific operating responsibilities for TMS components and subsystems

Using TIM as an example Operational Strategy, this table provides examples of how to develop associated requirements for TMC operators.

Speaker's Notes (18/35)

This slide focuses on the benefits and challenges associated with using contracted staffing approach for TMCs.

Speaker's Notes (19/35)

This slide focuses on the benefits and challenges associated with using agency staff for TMCs.

Speaker's Notes (20/35)

There are many benefits to developing a TMS staffing plan, including TMC staffing plans, and these plans can support a transportation agency's operating objectives, including components of the TMS . A TMS staffing plan supports agency resource planning and a business case for additional resources or realignment of current staffing resources, can identify needs and methods to acquire staff with specific skill sets, and can help agencies identify where future TMS enhancements may require assessing staff capabilities.

Speaker's Notes (21/35)

Conceptually, a TMC staffing plan may identify current TMC functions, services, activities supported, existing staffing roles and staff levels, job descriptions, personnel needs, support resources, current and possible future staffing structure and needs the agency is striving to support or realize, and options to obtain these services. Aligning TMC staffing needs and plans may also consider future TMS improvements, expansion of services, major enhancements to existing or use of new operations strategies may occur. The level of effort to develop and the level of details captured within a staffing plan may vary based on the size of the agency's TMS, the maturity or resources available to support the agency's TSMO program

Speaker's Notes (22/35)

None.

Speaker's Notes (23/35)

The following are some of the challenges associated with defining new TMC roles. Creating new roles can meet specific needs of TMC operations and provide paths for TMC staff to grow professionally. Examples include allowing staff with demonstrated technical capabilities to grow into more technically focused roles, such as traffic signal timing, incident management support, and data analysis and reporting.

Speaker's Notes (24/35)

Whether agencies use in-house staff or contractor staff, they face the challenges of adapting to expanded TMS requirements and TMC roles, functions, and/or services. Transportation agencies and contractors that supply staff also have challenges with defining specific technical roles, aligning compensation with roles, and/or recruiting and retaining staff.

Speaker's Notes (25/35)

The type of contract mechanism may influence how the agency procurement is structured. Understanding the differences between different contract options, including performance-based contracts, fixed-price or lump-sum contracts, cost-plus and cost-plus-fixed-fee, and time and materials is essential to developing a contracting strategy that will meet the agency's TMC operating objectives. For example, if an agency recognizes that some level of flexibility is needed to allow contractors to staff up for seasonal coverage during winter months, a fixed-price contract might not be a viable option.

Speaker's Notes (26/35)

The following are expectations of TMC staffing contractors. Performance expectations, metrics, milestones, and other criteria must be clearly defined and are the incentive to the contractor for achieving expectations.

Speaker's Notes (27/35)

Transportation agencies and TMC staffing contractors use a variety of recruiting tools and methods to attract qualified candidates to TMC operations roles. Online job posting services and professional social networks can reach a broad audience of potential candidates. Universities, community colleges, or technical training programs may be able to provide different types of candidates for different roles.

Targeting job advertisements and TMC career opportunities to specific candidate pools is another successful strategy used by several TMCs.

Speaker's Notes (28/35)

Interviews with several State DOTs identified the STAFF RECRUITMENT and RETENTION considerations presented on this slide.

Speaker's Notes (29/35)

Interviews with several State DOTs identified the STAFF RECRUITMENT and RETENTION challenges presented on this slide.

Speaker's Notes (30/35)

None.

Speaker's Notes (31/35)

TMS Resources include:

- TMC PFS Website.
- National Operations Center of Excellence (NOCoE) TMS Portal.
- NOCoE's TMS Staffing and Operators Resources.
- NOCoE's Next Generation of TMSs Resources.

Speaker's Notes (32/35)

TMS Staffing Resources include:

- FHWA's report on TMC Operator Requirements and Position Descriptions.
- FHWA's report on Aligning Traffic Management Center Staffing Capabilities for the Future of Systems Operations.
- FHWA's report on Human Factors Design Guidelines.
- FHWA's report on TMC Staffing and Scheduling for Day-to-Day Operations.
- NOCoE's HR Resources.

Speaker's Notes (33/35)

References include:

1. FHWA's CMM web page
2. FHWA's report on TMC Operator Requirements and Position Descriptions.
3. FHWA's report on Aligning Traffic Management Center Staffing Capabilities for the Future of Systems Operations.
4. FHWA's TMC Pooled-Fund Study web page.
5. NOCOE's TMS Portal.
6. NOCoE's TMS Staffing and Operators Resources web page.

Speaker's Notes (34/35)

Additional References include:

7. NOCoE's Next Generation of TMSs Resources web page
8. FHWA's report on Human Factors Design Guidelines.
9. FHWA's report on TMC Staffing and Scheduling for Day-to-Day Operations.
10. NOCoE's HR Resources web page.

Speaker's Notes (35/35)

None.