

Methods and Tools To Estimate Staffing Needs for TMSs

Transportation management systems (TMS) enable agencies to actively monitor and manage traffic conditions, share information with travelers and partners, and manage the use of operational strategies. TMSs vary significantly in types of services provided, functions performed, geographic coverage of service areas, types of environments covered, and available resources or staff to manage traffic. Staff within a TMS's traffic management center (TMC) may be needed during peak travel periods only; as necessary for special events; or 24 hours a day, 7 days a week, all year.

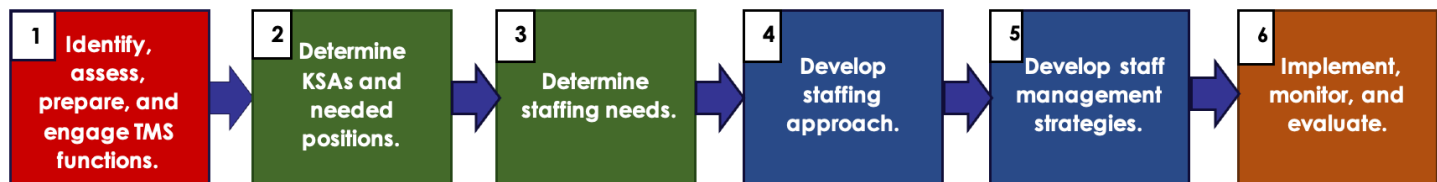
Estimating current and future staffing and resource needs is essential to ensuring TMSs sustain or meet operational needs and performance expectations. However, agencies face numerous challenges and constraints in developing staffing plans and estimating and obtaining approval for the staff and resources needed to operate TMSs. Thus, each agency may use different methods and tools and consider a range of different issues to estimate current and future TMS staffing and resource needs.

Challenges with estimating staffing needs include the following:

- Quantifying needed skills for TMSs.
- Understanding the metrics and data needed to estimate staffing.
- Hiring or developing staff with specific expertise.
- Training staff in specific technical areas.
- Modifying staff roles and job descriptions.
- Supporting TMSs with a range of needed skills and resources.
- Expanding current capabilities and resources.

Analytical methods and assessment tools enable agencies to make informed decisions on the amount of staff and types of positions and resources needed to meet current and future TMS staffing needs. A process for identifying and estimating staffing needs can be described in six steps (figure 1). Critical parts of the process for estimating staffing needs are as follows:

- Identifying the TMS functions in step 1.
- Determining the needed knowledge, skills, and abilities (KSAs) in step 2.
- Forecasting the future demand and staffing needs and calculating the staffing levels in step 3.
- Determining the preferred staffing approach in step 4



Source: Federal Highway Administration (FHWA).

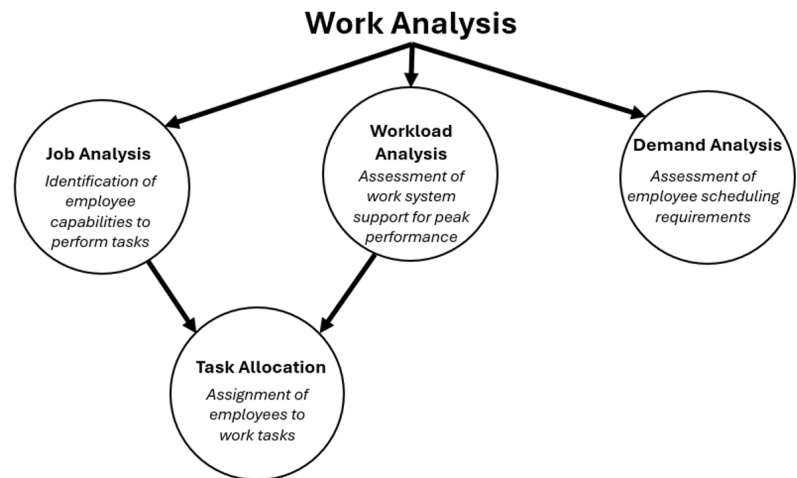
FIGURE 1. Process for estimating and identifying staffing needs.

During step 1 of the process, the agency identifies the TMS functions, including the services and actions that support the functions. This identification may encompass the supporting TMS program, services, actions (e.g., maintenance), TMC management and operations, and any contract management or oversight needed. During step 2, the agency collects information about the KSAs that will be needed to fulfill the TMS functions and then uses this information to identify needed job classifications and develop position descriptions.

During step 3, the agency collects data on current staffing demands and performance and forecasts future demand for TMS functions. Additionally, analyzing the work that needs to be done is at the heart of estimating staffing needs; thus, as part of step 3, the agency can benefit from a work analysis, which uses the information collected in steps 2 and 3. The work analysis (figure 2) examines job-related activities and employs several methodologies that agencies can use to forecast staffing needs.

A work analysis includes the following steps:⁽¹⁾

1. A job analysis to determine the basic elements of work required and assess the employee characteristics necessary to perform each element. TMS plans, a concept of operations, and TMS assessments can be valuable tools in initiating a job analysis.
2. A workload analysis to decide whether work systems are designed to enable peak performance by employees.
3. A demand analysis to determine the need for employee time based on the demand for TMC services.
4. A task allocation exercise to assign discrete work activities to employees based on the results of job and workload analyses.



Source: FHWA.

FIGURE 1. Work analysis.

Challenges encountered in estimating staffing needs may include the following:

- Identifying and collecting the right data.
- Determining the methodology to use to estimate needed staffing.
- Identifying and selecting appropriate performance measures.
- Understanding the metrics and data needed to estimate staffing.
- Predicting future staffing needs.

DESIRED OUTCOMES

- Improve agency capabilities in conducting workload analysis for TMS staffing estimation.
- Raise agency awareness of possible methods, tools, and issues to consider with estimating staffing needs.
- Improve agency strategies and procedures for supporting the estimation of TMS staff.
- Illustrate how future demand can be used to estimate staffing needs and improve scheduling.

KEY ISSUES TO CONSIDER

- Estimating TMS staffing needs and resources is part of an agency's human resources and traffic system management and operations programs and processes.
- Identifying all the TMS functions, actions, and services important for estimating TMS staffing needs and resources is essential.
- Learning what metrics to use and what data may be available for estimating staffing needs may be required.
- Projecting into the future to predict how automation or other technologies may affect staffing needs may be challenging.

CURRENT PRACTICES

Demand Analysis—Florida Department of Transportation (FDOT)¹

- FDOT’s “[Regional Transportation Management Centers](#)” website features links to the agency’s TMCs.⁽²⁾
- FDOT’s demand analysis uses historical values for workload by position type in calculating full-time equivalent staffing needs. Historical data is kept in a database for easy reference and analysis. The database supports each district in estimating TMS staffing needs.
- The analysis estimates staffing needs in terms of annual hours per position and associated budget requirements using data, such as staff count, freeway centerline miles, arterial signals, express lane miles, and ramp meters.
- The analysis also calculates additional elements of TMC staffing needs, such as the number of events expected to occur within the fiscal year.

Workload Analysis—Washington State DOT (WSDOT)²

- WSDOT’s “[Traffic Management Centers \(TMCs\)](#)” website describes the agency’s TMCs.⁽³⁾
- WSDOT’s workload analysis analyzes workload in the context of agency function (operations, incident management, dynamic message signs, reversible roadway operations, etc.)
- The analysis estimates expected activity levels based on earlier traffic operation experience.
- The analysis rates functions within the TMC based on impact to safety, supporting regulatory control enforceable by law, and advising travelers.
- The analysis bases time required by operators for events and service activities on staff experience and WSDOT’s “Guidelines for TMC Transportation Management Operations Technician Staff Development” from the internal document.

Staffing Analysis—Texas DOT (TxDOT)³

- TXDOT’s [Transportation Systems Management and Operations](#) website provides additional information.⁽⁴⁾
- TXDOT’s staffing analysis combines quantitative and qualitative analyses to estimate needed staffing levels.
- Quantitative analysis uses data that may include current staffing levels, annual turnover rate, number of intelligent transportation system (ITS) devices in the field, centerline miles monitored, and vehicle miles of travel.
- Qualitative analysis considers job functions, new technologies added to the TMS, upcoming major roadway projects, difficulty filling positions, and current operational efficiency.
- The analysis starts with the current staffing levels and then modifies that number based on factors, such as turnover rate (which adds to staffing needs) and total number of ITS devices, using averages for the number of devices an operator can monitor and control.
- Qualitative factors adjust the results of the quantitative analysis by one operator for each of the identified factors.

¹FDOT. 2022. *ITS Operations Budgeting Model v2.0*. Unpublished internal spreadsheet tool.

²WSDOT. 2012. *Evaluation of Operator Staffing Levels and Associated Space Requirements*. Unpublished internal document.

³Texas DOT. 2022. *Development, Integration, Implementation, and Maintenance Services for Traffic Management System (DIIMS) Transportation Management Center Staffing Analysis*. Internal document.

LESSONS LEARNED

- TMS managers may rely on ad hoc processes for estimating staffing needs rather than use tools, analysis methods, and assessment of data on staff performance.
- TMS managers may want to include support activities, such as contract management and contractor oversight, in staffing estimates.
- Agencies may be able to fill less positions than the number identified through the staff estimating process because of budget constraints, policies, or legislation.
- Cost-benefit analyses are commonly used to justify new staff positions when funding is requested.
- Staffing plans should consider factors, such as organizational structure, agency staff versus contract staff, scalability (based on size, complexity, and capabilities), available agency resources and services provided (type and size of area serviced, TMC operational hours), and gaps in current or future staffing needs.
- Changes in demands on TMSs, such as number of incidents or number of ITS devices, can be considered in estimating staffing needs.

ADDITIONAL RESOURCES

- National Operations Center of Excellence (NOCoE) [Traffic Management Systems and Centers](#) web page.⁽⁵⁾
- FHWA [Pooled-Fund Study](#) webpage.⁽⁶⁾

REFERENCES

1. Wolf, M., D. Folds, J. B. Ray, and C. T. Blunt. 2006. *Transportation Management Center Staffing and Scheduling for Day-to-Day Operations*. Report No. FHWA-OP-06-XXX. Washington, DC: Federal Highway Administration.
2. FDOT. "Regional Transportation Management Centers" (webpage). <https://www.fdot.gov/traffic/its/projects-deploy/rtmc.shtm>, last accessed November 18, 2024.
3. WSDOT. "Traffic Management Centers (TMCs)" (webpage). <https://wsdot.wa.gov/travel/operations-services/traffic-management-centers-tmcs>, last accessed November 18, 2024.
4. TxDOT. "Transportation Systems Management and Operations" (website). <https://www.txdot.gov/safety/tsmo.html>, last accessed November 22, 2024.
5. NOCoE. 2022. "Traffic Management Systems and Centers" (web page). <https://transportationops.org/traffic-management-systems-and-centers>, last accessed November 18, 2024.
6. FHWA. 2024. "TMC Pooled-Fund Study" (web page). <https://tmcdfs.ops.fhwa.dot.gov/>, last accessed November 18, 2024.

Notice—This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The U.S. Government assumes no liability for the use of the information contained in this document.

Non-Binding Contents—Except for the statutes and regulations cited, the contents of this document do not have the force and effect of law and are not meant to bind the States or the public in any way. This document is intended only to provide information regarding existing requirements under the law or agency policies.

Quality Assurance Statement—The Federal Highway Administration (FHWA) provides high-quality information to serve Government, industry, and the public in a manner that promotes public understanding. Standards and policies are used to ensure and maximize the quality, objectivity, utility, and integrity of its information. FHWA periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement.

Disclaimer for Product Names and Manufacturers—The U.S. Government does not endorse products or manufacturers. Trademarks or manufacturers' names appear in this document only because they are considered essential to the objective of the document. They are included for informational purposes only and are not intended to reflect a preference, approval, or endorsement of any one product or entity.