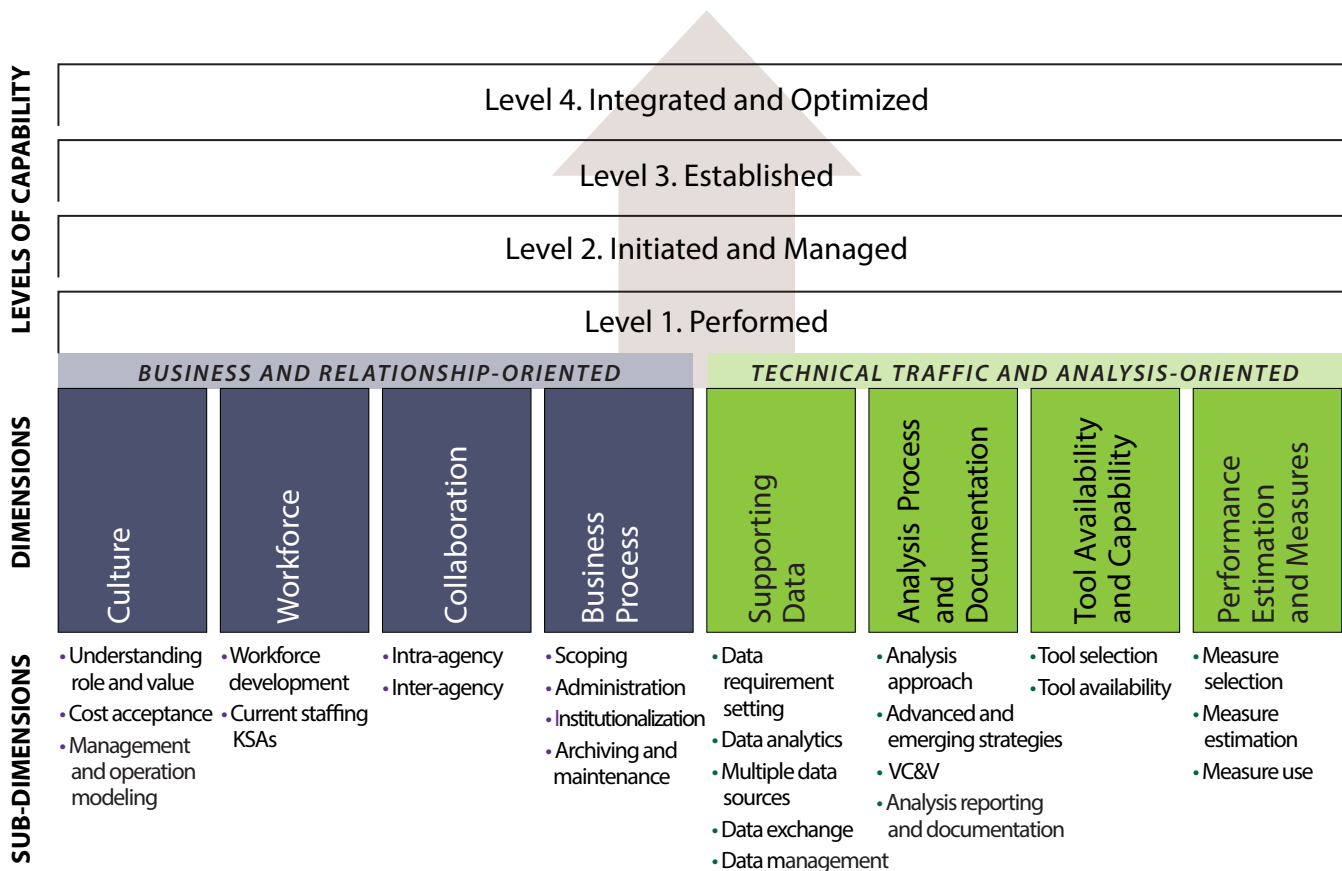Source: @Getty Images

TRAFFIC ANALYSIS CAPABILITY MATURITY FRAMEWORK

◼ INTRODUCTION AND MOTIVATION

Traffic analysis is key to developing and managing a transportation system. Public agencies recognize that modern traffic analyses require capabilities and resources that are not always available. Building on the success of the transportation systems management and operations (TSMO) capability maturity model (CMM)[1], FHWA has now developed a Traffic Analysis capability maturity framework (CMF) to support agency advancement. As with the TSMO CMM, the Traffic Analysis CMF "converts what were previously fuzzy concepts into specific manageable actions to improve capability"[2]. Figure 1 illustrates the Traffic Analysis CMF concept.

LEVELS OF CAPABILITY	
Level 4. Integrated and Optimized	
Level 3. Established	
Level 2. Initiated and Managed	
Level 1. Performed	

	BUSINESS AND RELATIONSHIP-ORIENTED				TECHNICAL TRAFFIC AND ANALYSIS-ORIENTED			
DIMENSIONS	Culture	Workforce	Collaboration	Business Process	Supporting Data	Analysis Process and Documentation	Tool Availability and Capability	Performance Estimation and Measures
SUB-DIMENSIONS	• Understanding role and value • Cost acceptance • Management and operation modeling	• Workforce development • Current staffing KSAs	• Intra-agency • Inter-agency	• Scoping • Administration • Institutionalization • Archiving and maintenance	• Data requirement setting • Data analytics • Multiple data sources • Data exchange • Data management	• Analysis approach • Advanced and emerging strategies • VC&V • Analysis reporting and documentation	• Tool selection • Tool availability	• Measure selection • Measure estimation • Measure use

KSAs - knowledge, skills, and abilities, TSMO - transportation system and management, VC&V - verification, calibration, and validation

Figure 1. Diagram. Traffic Analysis CMF concept.
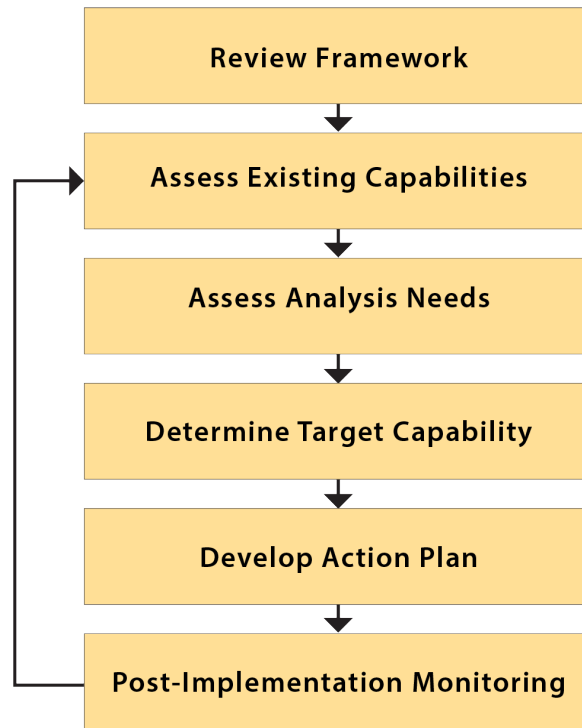
Source: FHWA.

[1,2] Federal Highway Administration. (2012). *Creating an Effective Program to Advance Transportation System Management and Operations*, Primer No. FHWA-HOP-12-003, Washington, DC. https://ops.fhwa.dot.gov/publications/fhwahop12003/fhwahop12003.pdf

OVERVIEW OF THE FRAMEWORK

The objective of the Traffic Analysis CMF is to assist traffic engineers, planners, and traffic operations professionals with a structured approach to navigate complex institutional challenges regarding traffic analysis. Application of the Traffic Analysis CMF will enable agencies to identify opportunities for improvement and develop a programmatic focus for traffic analysis to create analytical consistency and uniformity across and within Federal, State, regional, and local transportation agencies.

STEPS TO UTILIZE THE TRAFFIC ANALYSIS CMF

Agencies can use the Traffic Analysis CMF to self-assess their strengths and weaknesses, and to identify recommended actions to improve their capabilities in different dimensions of traffic analysis. Agencies should use a collaborative process when applying the CMF. This could involve a stakeholder workshop. The stakeholders can first determine their capability level, using a simple series of look-up tables and multiple-choice questions within the final report.[3] The stakeholders could then identify, filter, and compile a set of actions appropriate to the region or agency, using a recommended set of actions within the final report. Typically, a local lead agency or department will organize the stakeholder workshop. Follow-up meetings can then identify how to implement and review the implementations of the actions.

Source: FHWA.

Figure 2. Diagram. Steps for utilizing the Traffic Analysis CMF.

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3   Hadi, Mohammed, and Dennis Mitchell, and David Hale, and Renee Hurtado. (Forthcoming). Traffic Analysis Capability Maturity Framework.

■ TABULAR APPROACH

Similar to the TSMO CMM[4], the Traffic Analysis CMF provides high-level assessment and guidance through a series of tables. Agencies can use table 1 (due to space limitations, only the initial portion is shown here) for self-evaluation, while subsequent tables (e.g., table 2) identify the related strategies for capability improvement. Together, these provide a quick assessment of key challenges facing the agency in improving the traffic analysis effectiveness and actions to achieve the improvements. Table 1 presents the eight critical capability maturity dimensions – as defined in the first column – needed to develop and maintain an effective traffic analysis program. For evaluation purposes, four distinct levels of agency capability are available for each of the eight dimensions. Select the cell that most closely reflects the agency's current capability level for each subdimension. Then, go to the subsequent tables, which present the general strategies/actions needed to move up to the next level of capability for each subdimension.

Table 1. Criteria for the maturity levels by sub-dimension of the eight capability maturity dimensions of traffic analysis.

	Current Levels of Capability Maturity			
DIMENSION	Level 1-Performed	Level 2-Initiated and Managed	Level 3-Established	Level 4-Integrated and Optimized
Business Process				
Scoping	No adopted guidance. Project-driven scoping.	Basic guidance, but the agency does not consider the guidance as SOP or policy. Limited tool, data, and review requirement consideration in scoping.	Detailed SOP/policies based on latest national findings. Detailed data requirements, tool requirements, and review procedures in scoping.	SOP expands to meet requirements of different functional areas individually in an integrated manner.
Administration	No administration and contacting processes or support. No method for cost estimation.	Started development of procurement process, staff, documentation, and templates. Basic methods for cost estimation.	Established contracting and procurement process, staff, documentation, and templates. Detailed cost estimated methods.	Detailed analysis type-specific procurement and contracting processes, guidance, and templates. Detailed cost estimation methods.
Institutionalization	Ad-hoc institutionalization.	Minimal institutionalization for specific functions.	Established institutionalization in most processes.	Integrated institutionalization to support all processes and decision levels.
Archiving and maintenance	Models not maintained or archived.	Ad-hoc maintenance and archiving.	Established process for archiving and sharing models.	Extended process for archiving, sharing, maintaining, and updating models.

Table 2. Actions to advance to the next level for the business process dimension.

SUB-DIMENSION	Level 1 to 2	Level 2 to 3	Level 3 to 4
Scoping	Develop or adopt scoping guidance.	Adopt a standard operation guidance to act as a policy for the analysis.	Update scoping to consider the requirements of various decision processes.
Administration	Start developing administration and contracting support for traffic analysis.	Establish administration and contracting support for traffic analysis.	Refine administration and contracting support for traffic analysis.
Institutionalization	Initialize institutionalization process.	Extend institutionalization process.	Integrate institutionalization process.
Archiving and maintenance	Include in guidance.	Require data archiving and management plan.	Require maintenance plan.

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4   FHWA. (2012). Primer No. FHWA-HOP-12-003.

■ ADDITIONAL DETAILS

The tabular approach described in the previous section can provide a quick assessment of capabilities and recommendations of actions to advance to the next level of capability maturity. The developed framework provides the option for an assessment of agency capabilities via multiple-choice questions (see adjacent Q&A scoring example), which can be used in combination with (or in lieu of) the tables for capability assessment. In some cases, the multiple-choice questions contain more verbose information than the tables. Some users may prefer the use of the question-and-answer format, particularly in a stakeholder workshop setting. The agencies' answers to the questions can help to further identify the capability maturity of the agency. Then, the CMF provides detailed descriptions of the suggested actions to advance to the next level of maturity (see adjacent detailed actions example).

Self-Assessment Via Q&A Scoring

Q1: Have you developed and used guidance or Standard Operation Procedures (SOPs) for scoping the analysis projects?

a. No, we do not have guidance or SOPs. We usually depend on project-driven scoping and budget allocation.

b. Yes, we have basic guidance that we developed or adopted from other States. However, we have not reviewed the latest national guidance and research findings to confirm and modify the guidance. The guidance is not an SOP or policy. We do not have a process for detailed consideration of modeling, data requirements, and detailed review procedure in scoping.

c. Yes, we developed detailed SOPs and policy based on latest national findings. We also require the consideration of detailed data requirements, tool requirements, and review procedures in scoping.

d. Yes, we have an extended SOP that, in addition to what is mentioned in (c), meets the requirements of various decision processes associated with different functional areas individually in an integrated manner including areas such as long range planning, highway design, TSMO, connected and automated vehicles (CAV), managed lanes, and mobility as a service (MaaS). We also continuously monitor the national guidance and results from research and development efforts to update our guidance.

Detailed Recommended Actions

The action involves the use of an integrated modeling, data mining, and data analysis environment, which can support agency decisions. This sub-dimension will allow better support for decision-making. An FHWA project[5] proposed an integrated management support system for the use of business intelligence, which combines modeling and data analysis in support of agency decisions, as shown in figure 3.

Strategy Layer			
Performance Layer			
Consumer • Executive • Tactical Manager • Operations Manager • Operator	Decision Processes	Real-Time Decision Support Systems	Operational Data Stores
Producer • Data Analyst • Transportation System Analyst	Analytic Processes	**Data Repositories** • Data Marts • Data Warehouse	Other Agency Data
Enabler • IT Staff	Information Governance Processes	Data and Simulation Analytic Tools	Crowdsourcing Data
Travelers			Private Sector Vendor Data
PEOPLE LAYER	PROCESS LAYER	PLATFORM LAYER	DATA LAYER

Source: FHWA.
IT = information technology.

Figure 3. Illustration. Proposed integrated management support system framework[6].

[5, 6] Hadi et al. (Forthcoming). *An Integrated Management Support System – Final Report*.