Assessing and Reporting on Traffic Management System (TMS) Capabilities and Performance

Transportation Management Center (TMC) Pooled-Fund Study[(1)]

Federal Highway Administration (FHWA)

December 2024

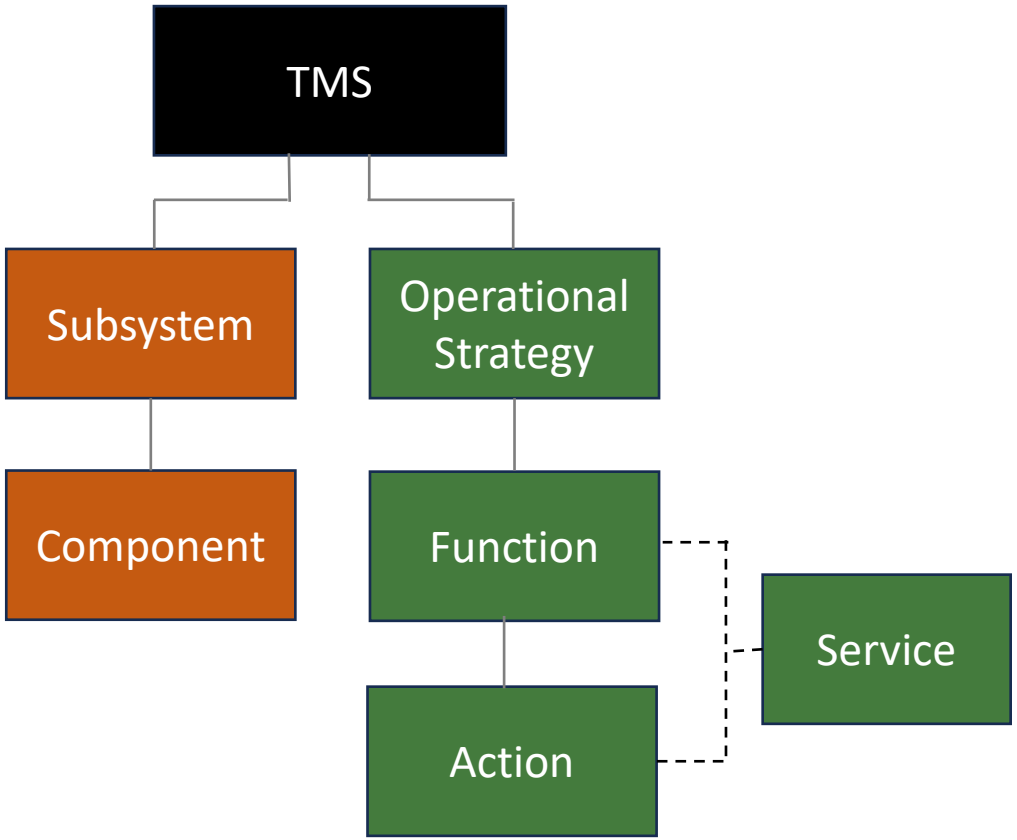
U.S. Department of Transportation
Federal Highway Administration

Presentation Outline

Topic	Slide Numbers
1. Framing TMSs and TMS Assessments	3–7
2. Assessing TMS and the Assessment Process	8–12
3. TMS Assessment Example	13–20
4. Planning and Preparing for a TMS Assessment	21–25
5. Conducting a TMS Assessment	26–29
6. Developing an Action Plan	30–35
7. Resources and References	36–37

Framing the Discussion: TMSs

- Resources typically do not exist to support assessing and benchmarking TMS institutional performance.
- The following assessment considerations are unique:
  - Day-to-day management and operations.
  - Operations staff, policies, and procedures.
  - TMS planning, design, and implementation.
  - TMS data sharing and external stakeholders.
  - Maintenance and repair of TMS assets.



Source: FHWA.

Note: A solid line indicates composition and a dashed line indicates realization.

Framing the Discussion: Assessments

An assessment is a formal, structured process for identifying current levels of capabilities and performance.

Use an established process or framework for conducting assessments.

Involve key stakeholders in the process.

Outputs of assessments can be used to:

- Identify enhancements to improve performance.
- Identify opportunities and develop consensus around needed improvements.
- Identify immediate priorities for action or changes.

The Relationship of TMS and Transportation Systems Management and Operations (TSMO) Assessments

Agencies may consider conducting a TMS-specific assessment, in addition to other assessments conducted in support of their TSMO program, such as the following assessments:

- Active traffic management.
- Traffic management.
- Active demand management.
- Traffic incident management.
- Planned special events.
- Traffic signal management.
- Work zone traffic management.
- Road weather management.

Dimensions or Process Improvement Areas[2]	What Is It?
1. Business process.	Plans, programs, and budget.
2. Systems and tech.	Approach to building systems.
3. Performance measurement.	Use of performance measures.
4. Workforce.	Improving the capability of the workforce.
5. Culture.	Changing culture and building champions.
6. Collaboration.	Improving working relationships.

Motivation for Assessing TMSs

Provides a means for assessing:

- System effectiveness and reliability.
- TMS management and operation.
- Operational decisionmaking implications.
- TMS assets' condition.
- Actions for continuously improving capabilities.

Provides a basis for:

- Improving TMSs management and operation, considering implications.
- Identifying opportunities to improve TMS capabilities and performance.
- Creating a baseline to compare future capabilities and performance.
- Engaging key stakeholders to build and maintain support for improvements or allocation of resources.
- Enhancing assets management.
- Identifying and prioritizing needed improvements.

Assessing TMS Considerations

- Managing and operating TMS day-to-day:
  - Maintenance and repair of the system and assets.
  - Operations of the system and response to changing conditions and events.
  - Management of operational strategies.
- Staffing to support TMSs.
- Creating policies, procedures, and tools to support managing and operating TMSs.
- Including TMS plans, requirements, and resources in other programs, plans, initiatives, services, or efforts (e.g., TSMO).
- Planning, design, development, and implementation of TMSs.
- Planning for the agency's next-generation TMS.

A Framework to Assess TMSs

What other dimensions might agencies consider when assessing TMSs?

Existing Dimensions[2]

Dimensions	Description
Business processes.	Plans, programs, and budget.
Systems and technologies.	Approach to building systems.
Performance measurement.	Use of performance measures.
Workforce.	Improving the capability of the workforce.
Culture.	Changing the culture and building champions.
Collaboration.	Improving working relationships.

+

Missing Improvement Areas

Dimensions	Description
Management and operations.	Managing and operating daily.
Maintenance and repairs.	Conducting daily maintenance and repairs.
Sharing data.	Policies, procedures, agreements, and activities to enable sharing and using data with sources external to TMS.

=

TMS Dimensions

Dimensions	Description
1. Business processes.	Plans, programs, and budget.
2. Systems and technologies.	Approach to building systems.
3. Performance measurement.	Use of performance measures.
4. Workforce.	Improving the capability of the workforce.
5. Culture.	Changing the culture and building champions.
6. Collaboration.	Improving working relationships.
7. Management and operations.	***Managing and operating daily.***
8. Maintenance and repairs.	***Conducting daily maintenance and repairs.***
9. Sharing data.	***Activities to enable sharing and using data with sources external to TMS.***

Note: Bold-italic text signifies new dimensions specific for TMSs.

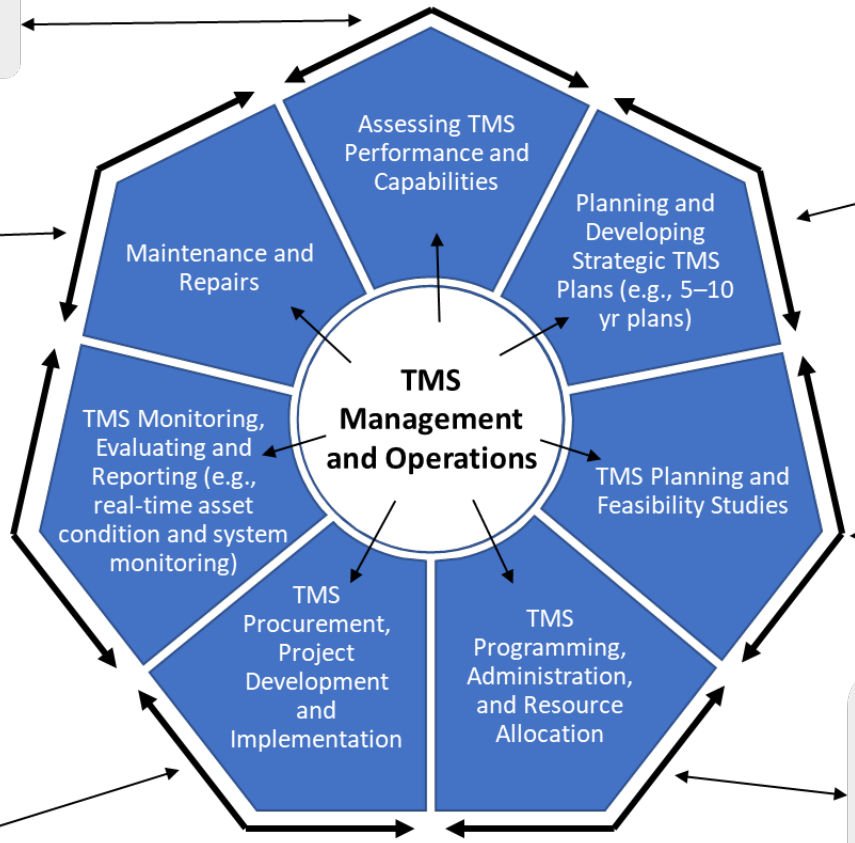
Activities Supporting the Active Management and Evolution of a TMS[3]

Capability Maturity Framework for TSMO (Traffic Management)

Conducting daily maintenance and repairs

Facilities performance monitoring and reporting,
TMS asset monitoring and reporting,
TMS asset performance evaluation,
TMS program and plan

Design, development, and procurement of projects (e.g., systems engineering), TMS program and plan, agency or regional ITS architecture



Agency strategic plan, TSMO program and plan, TMS program and plan, MPO TSMO or ITS plan, agency or regional ITS architecture

Planning and design of TSMO initiatives, operational strategies, or ITS projects (feasibility study, planning study), agency or regional ITS architecture

TSMO project selection and prioritization, TMS improvement projects, allocation of resources for maintenance and operations, TMS program and plan, agency or regional ITS architecture

MPO = metropolitan planning organization; ITS = intelligent transportation systems.

Source: FHWA.[3]

Assessing TMSs: Dimensions and Subdimensions(2)

Planning and Operational Focused Dimensions

Business Processes	*Culture*	*Collaboration*	*Workforce*	*Systems and Technology*
•TMS program and plan. •TMS and plan integrated into agency plans and programs. •Programming and budget. •Operating policies and procedures.	•Visibility of the TMS program within agency strategic plans. •TMS program integrated into TSMO and agency program plans and funding.	•Agency Collaboration. •Third-party relationships.	•Organizational structure and governance. •Staff development. •Staff recruitment. •Staff development and retention plans.	•Subsystem, components, and devices. •System multiyear plan. •System design. •Inventory assets and resources.

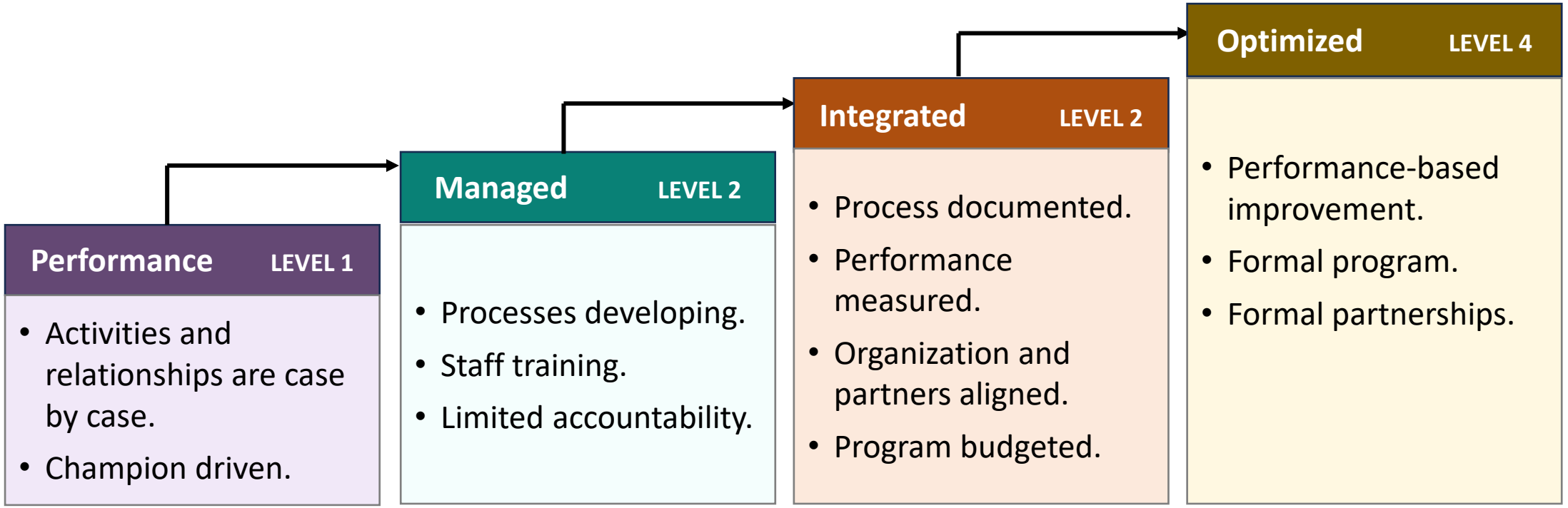
Technical Focused Dimensions

Sharing Data	*Performance*	*Management and Operations*	*Maintenance and Repairs*
•Data sharing. •Data-exchange procedures, agreements, APIs, and data formats. • Data use from other sources. •Interoperability.	•Data collection. •Performance measures. •TMS monitoring. •TMS asset monitoring.	•Service level and resiliency. •TMS operational capabilities. •TMS asset impact. •High availability and remote operations.	•Asset documentation. •Configuration management. •Maintenance request management. •TMS feature roadmap.

API = application programming interface.

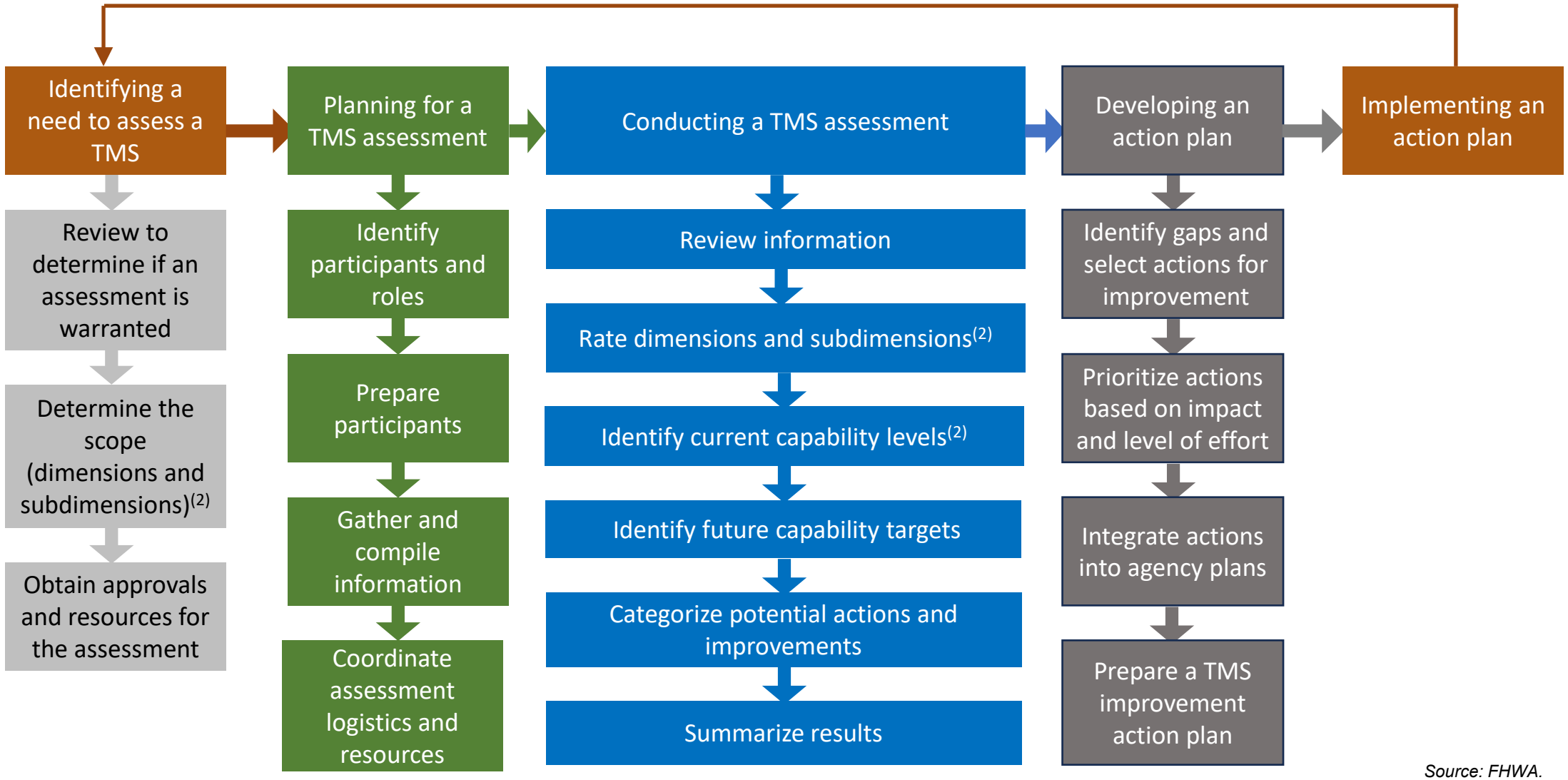
TMS Capability Levels(2)

- Capability levels help define current TMS capabilities and identify improvement opportunities.
- Each dimension is evaluated across four levels of capability maturity levels.



Source: FHWA.

The TMS Assessment Process



Source: FHWA.

Assessing Dimensions: Systems and Technologies Example(2)

An example of assessing one dimension: systems and technologies.

Today's TMSs

Focused on improving travel safety, efficiency, and predictability on the surface transportation system using:

- Field devices.
- ITS infrastructure.
- Communications media.
- Information technology.
- Operations personnel.
- Operational strategies and control plans.
- Active management and control of traffic.
- Operations centers.

Technology Challenges Facing Today's TMSs

- A limited ability to share information internally within the agency, with other systems, or with the public.
- A limited ability to capture or use data from emerging sources or third parties.
- A lack of capabilities or resources to automate system functions or use operational strategies.
- An operating environment, software, or components that are difficult to modify, replace, or integrate with new or emerging technologies or devices.
- A system replacement or upgrade may require adding functions, services, or technologies due to limitations in the system design.

Assessing Capability Levels: Systems and Technologies Example(2)

The following table contains examples of descriptions for all four levels of the systems and technologies dimension. Descriptions generally follow the four capability level descriptions. Agencies may choose to emphasize specific aspects of systems and technologies in their individual assessment.

Dimension Description	Level 1	Level 2	Level 3	Level 4
Systems engineering requirements for operating and maintaining the TMS, including systems architecture, concepts of operation, standardization, and documentation processes. Focuses on key processes and aspects of technology procurement, operations, and planning.	Case-by-case approaches to TMS implementation are used without consideration of systems engineering and appropriate procurement processes. TMS architecture is not intentional.	The TMS is incorporated into the ITS architecture; TMS changes include ConOps and architectures. An appropriate procurement process is employed. The TMS uses proven technology. Staff is trained on system engineering principles. TMS staff, IT staff, and third-party providers are not fully working together well.	The TMS is reviewed on a case-by-case basis and emerging technologies are recognized. The TMS group works with the IT group and third-party vendors to establish technical standards, procure equipment, and increase capabilities.	The TMS program keeps pace with emerging technology and minimizes the use of outdated equipment. The systems engineering process is fully implemented at all stages of the TMS lifecycle. Strong synergy exists between the TMS and IT groups.

ConOps = Concept of Operations; IT = information technology.

Example Assessment: Systems and Technologies (1/2)

The following are examples of issues to consider when assessing the current capability level (analysis):[2]

- Focus on approaches to planning and building systems:
  - Ensure agency and stakeholder needs are addressed.
  - Follow systems engineering principles to develop and trace requirements, establish concept of operations, etc.
- Other issues to consider:
  - Technical feasibility.
  - The TMS concept of operations.
  - The condition of assets.
  - Economic feasibility.
  - The TMS structure and design.
  - Current and anticipated staff and contract support.
  - Planning, plans, and planned improvement projects.

Dimensions or Process Areas[2]	*What Is It?*
Business process.	*Plans, programs, and budget.*
Systems and technologies.	*Approach to building systems.*
Performance measurement.	*Use of performance measures.*
Workforce.	*Improving the capability of the workforce.*
Culture.	*Changing the culture and building champions.*
Collaboration.	*Improving working relationships.*
Day-to-day management and operations.	*Managing and operating daily.*
Day-to-day maintenance and repair.	*Conducting daily maintenance and repairs.*

Example Assessment: Systems and Technologies (2/2)

This chart contains examples of improvement opportunities to select for action plans when assessing the systems and technologies dimension.(2)

Technology Advances

- Emerging data sources.
- Travelers using mobile devices to share and use data.
- Innovative technologies and tools to analyze data.
- Advanced computing capabilities
- Open-source, agency-owned, off-the-shelf software.
- Enhanced ITS and traffic control device capabilities.
- Ability to share information with other systems and the public.

The Next Generation of an Agency's TMS

- Improvements to capabilities and entirely new functions or services.
- Real-time decisionmaking with highly automated operation to proactively manage traffic.
- Information sharing with other systems and service providers to improve safety and mobility.
- Modular components and expandable platforms that are easier for agencies to manage, operate, maintain, and modify to meet evolving future needs.

Key Functions of an Agency's Next-Generation TMS

- Monitor, calculate, and predict.
- Propose, select, and implement.
- Automate management and operation.

Example Improvement Actions for Systems and Technologies

This table provides examples of improvement actions for one subdimension of the systems and technologies dimension.(2)

Systems and Technologies: TMS ConOps Subdimension		
Achieving Level 2	**Achieving Level 3**	**Achieving Level 4**
Identify key processes needed to support the TMS ConOps development.	Develop the TMS ConOps and align with agency priorities.	Establish a formal, continuous improvement process for the TMS ConOps, integrated with overall agency processes.
Create basic documentation to explain the components and interfaces required for the TMS ConOps to use and administer the TMS.	Document and integrate interface specifications into the ConOps.	Align the TMS ConOps system architecture with formal internal and external partner specifications.
Develop interoperability and data for the TMS ConOps.	Manage and measure the adherence of the TMS ConOps to interoperability and data standards.	Agencywide adoption of and accountability to common interoperability and data standards in all system ConOps.

TMS Assessments: Example Subdimensions (1/3)

This table contains potential subdimensions for TMS assessment dimensions.(2) Agencies may decide to focus on a subset of these dimensions or adjust the subdimensions based on the agencies' specific needs.

Business Processes	Systems and Technologies	TMS Performance
• Setting TMS strategic direction and plans. • Planning for TMS improvements. • TMS program and plan. • Regional TSMO planning and plans TMS integration. • Managing TMS resources. • Managing TMS assets. • Pursuing TMS improvement projects.	• TMS feasibility and planning studies. • TMS concept of operations. • TMS structure and design. • TMS architecture. • TMS improvements and enhancements. • Inventory, document, and configure TMS assets. • Managing changes to TMSs.	• Data collection. • Performance measures. • TMS monitoring. • TMS asset monitoring. • Data management plan and services. • Reporting on TMS performance. • Incorporating TMS performance into agency and regional programs and plans.

TMS Assessments: Example Subdimensions (2/3)

This table contains potential subdimensions for TMS assessment dimensions.(2) Agencies may decide to focus on a subset of these dimensions or adjust the subdimensions based on the agencies' specific needs.

Workforce	Culture	Collaboration
• TMS staffing plan. • Monitoring, evaluating, and reporting on staff performance. • Position descriptions, requirements and performance expectations. • Procuring and managing staff resources needed to support TMSs. • Staff development. • Staff recruitment and retention. • Succession planning.	• Awareness of TMS program within the agency. • TMS incorporated into the agency strategic planning and plan. • TMS incorporated into TSMO program and plan. • Workplace desirability.	• Operational agency collaboration. • Third-party provider collaboration.

TMS Assessments: Example Subdimensions (3/3)

This table contains potential subdimensions for TMS assessment dimensions.[2] Agencies may decide to focus on a subset of these dimensions or adjust the subdimensions based on the agencies' specific needs.

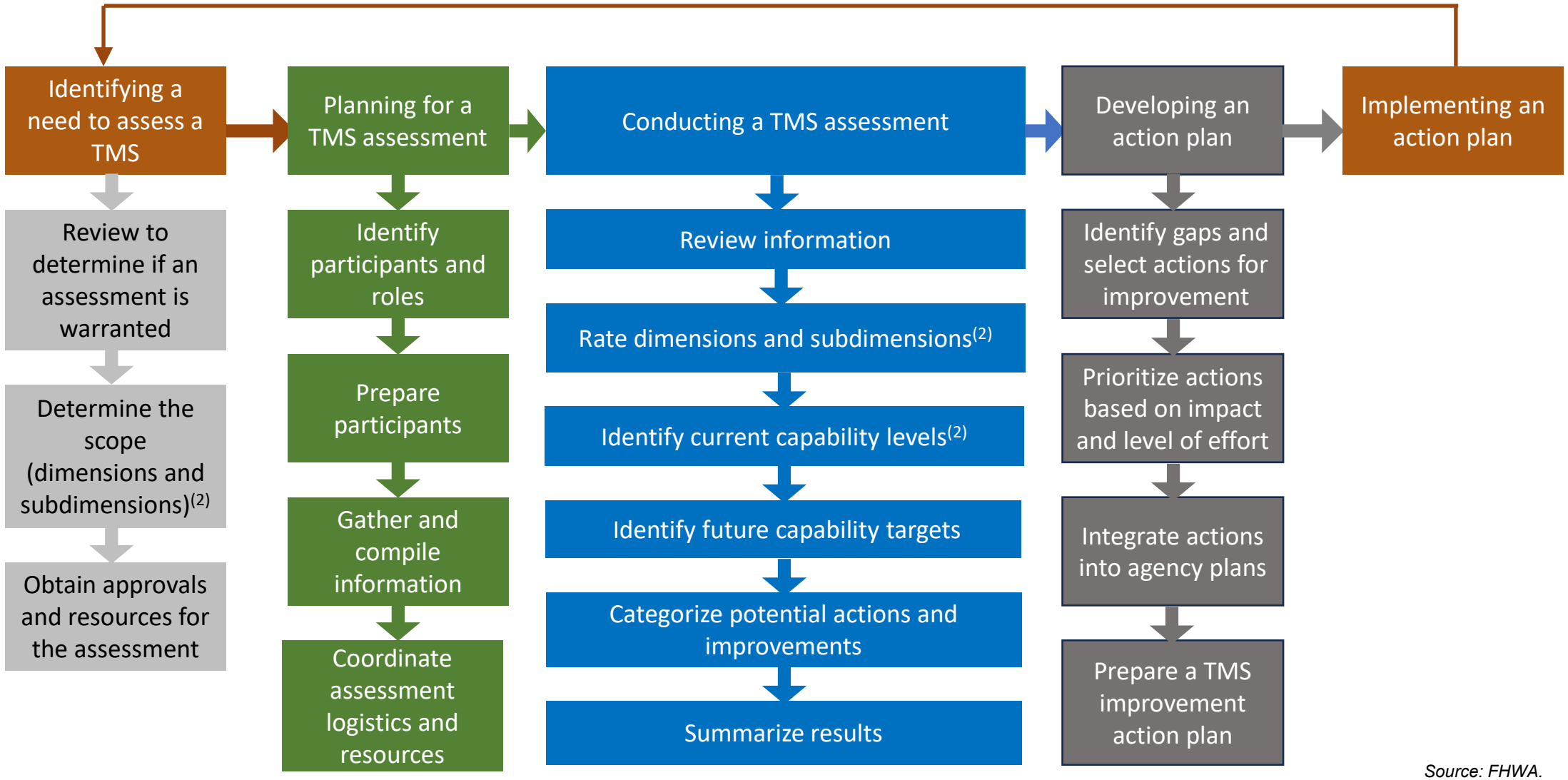
Sharing Data	Management and Operations	Maintenance and Repairs
• Internal agency data sharing. • External partner data sharing. • Third-party data integration. • Data management plan. • Managing APIs. • TMS subsystems, components, and device data sharing. • Testing, acceptance, and monitoring information sharing.	• Operational policies and procedures. • Managing and operating TMS. • Managing TMS support resources. • Monitoring travel conditions, asset conditions and TMS operations. • Remote and virtual operations. • Managing TMS for special events. • TMS security.	• Inventory, documentation and configuration of TMS assets and resources. • Maintenance management system. • Managing changes to TMS system. • TMS maintenance and repair plan and resources. • Managing repair and maintenance of TMS assets and resources.

Preparing for a TMS Assessment

Questions to consider when preparing for a TMS assessment:

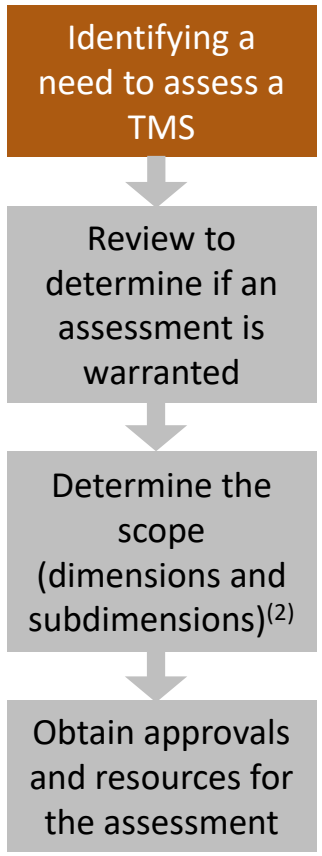
- Who will be involved in the assessment? What are their roles?
- What other resources are needed to support the assessment?
- How will stakeholders be engaged to support the assessment?
- Which topics (dimensions and subdimensions) are being included?(2)
- What information may need to be complied to support the assessment?
- How will results be documented?
- What process will be followed?

Preparing, Conducting, and Summarizing a TMS Assessment



Source: FHWA.

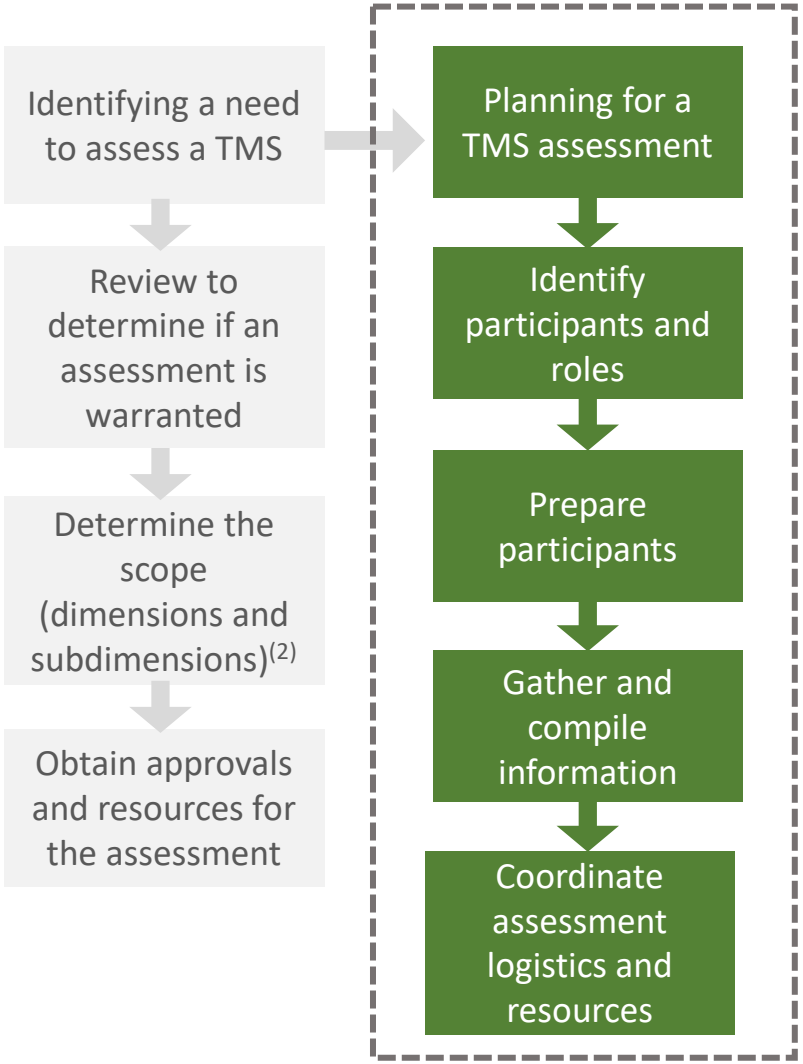
Reviewing and Identifying the Need to Assess a TMS



Source: FHWA.

- Check for any recently completed assessments.
- Determine if an assessment is needed.
- Decide the exact scope of the assessment:
  - Dimensions.(2)
  - Priorities.
  - Topics.
- Align with other projects or priorities.
- Obtain approval for assessment.

1. Planning for a TMS Assessment (1/2)



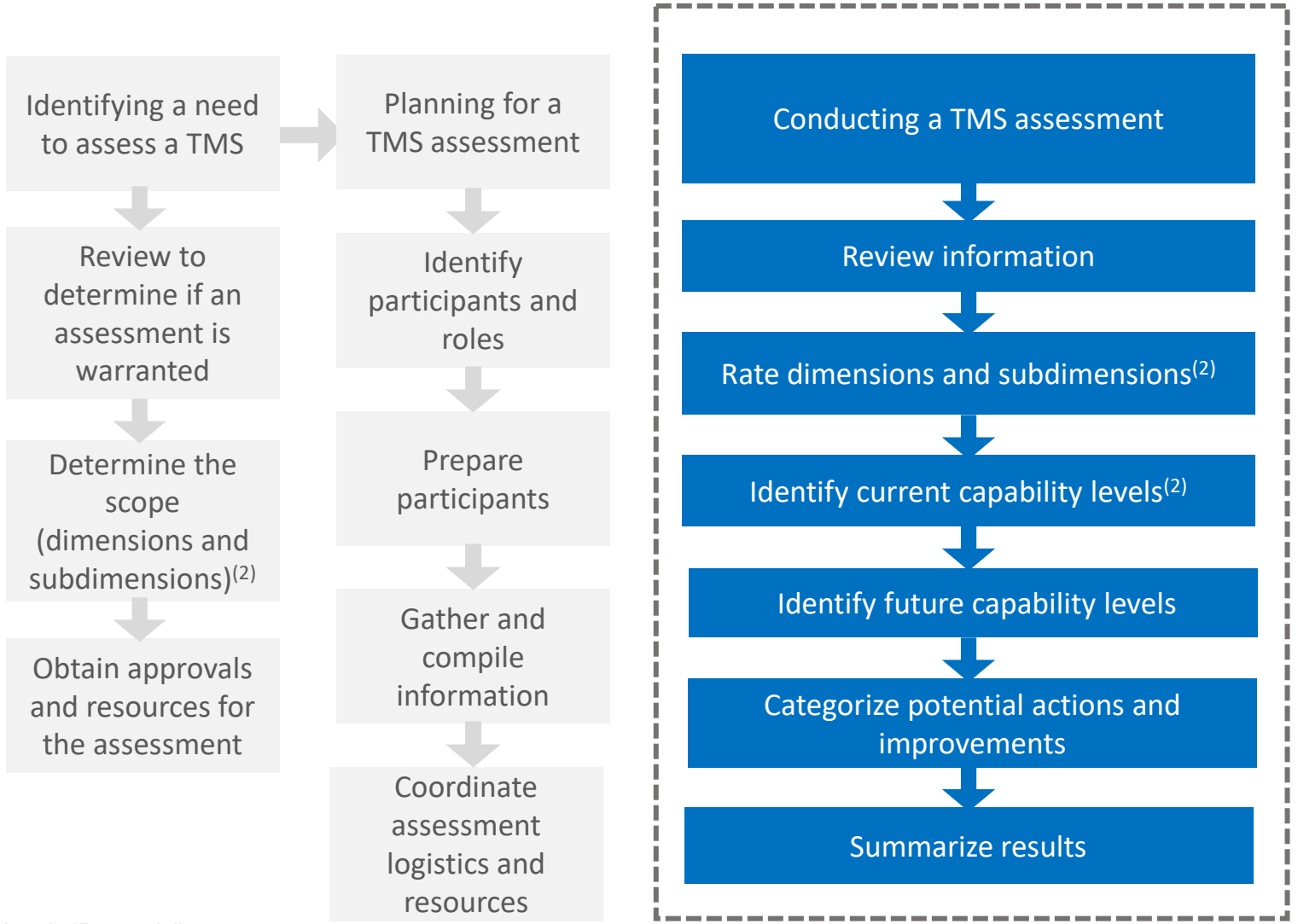
Source: FHWA.

- Identify participants and roles:
  - Champion.
  - Agency leadership.
  - Stakeholders.
- Prepare participants; ensure that participants understand the assessment process and dimensions.(2)
- Gather information to support the assessment.
- Coordinate assessment logistics:
  - Room and meeting location.
  - Schedule, dates, and invitations.

1. Planning for a TMS Assessment (2/2)

- Gather information:
  - Strategic goals and plans.
  - Agency and regional TSMO plans.
  - ITS strategic plans.
  - TMS asset condition, performance measures, and dashboards.
  - Traffic signal system and signal timing programs.
  - Agency staffing or training plans.
  - TMS program and plan.
  - Policies and operating procedures.
- Include participants:
  - TMS and TSMO staff.
  - Planning staff.
  - Capital program managers.
  - ITS maintenance staff.
  - IT staff.
  - Traffic operations center operators.
  - Public relations staff.
  - Partner agency stakeholders.

2. Conducting a TMS Assessment (1/2)



Source: FHWA.

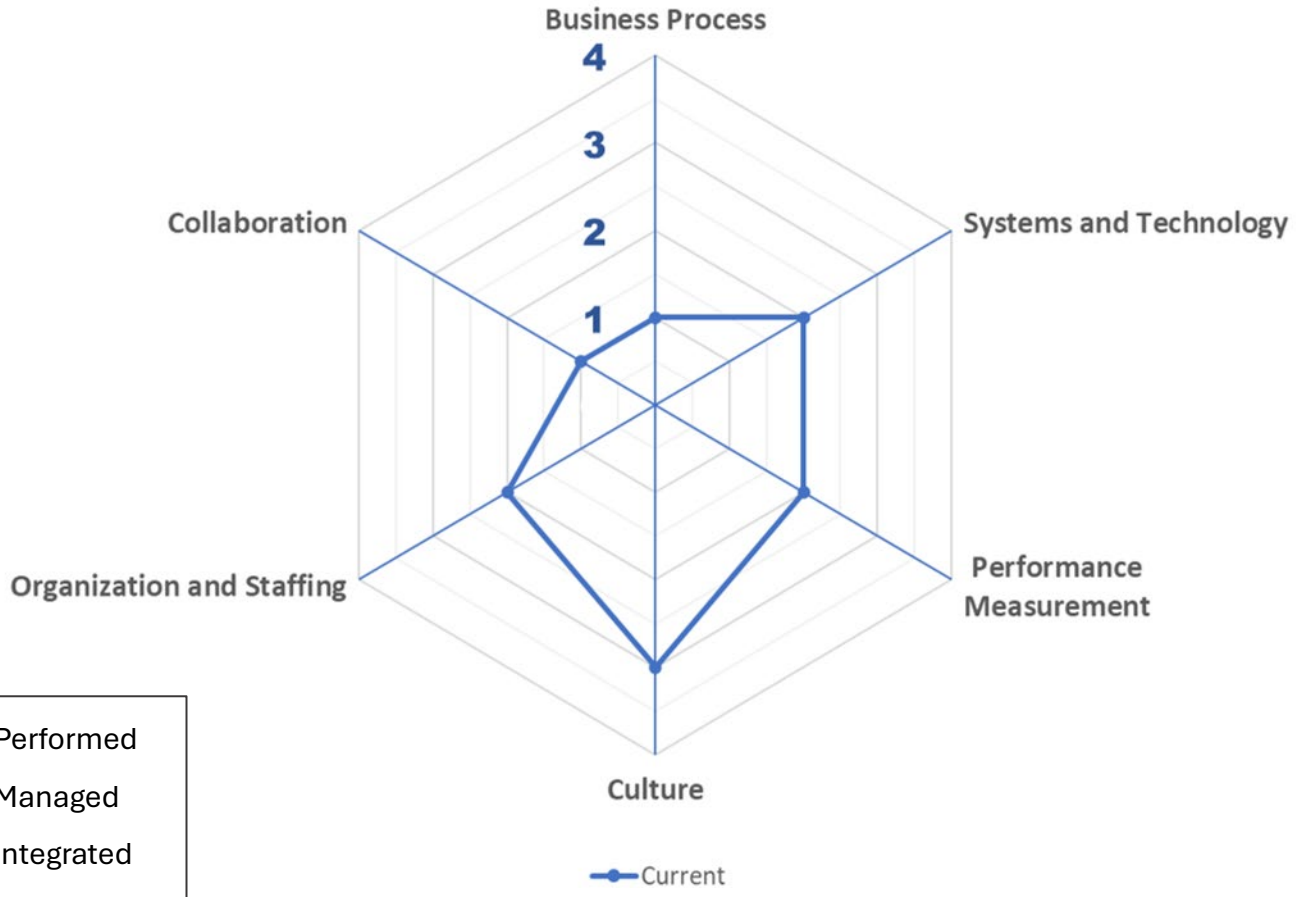
- Review information and engage stakeholders to rate selected dimensions and subdimensions.(2)
- Identify and assign current and target capability levels.(2)
- Identify and prioritize improvements.
- Categorize and prioritize actions for improving capabilities.
- Document selected target capability levels across each dimension.(2)

2. Conducting a TMS Assessment (2/2)

- Assign current levels of capability:[2]
  - Consider broad stakeholder feedback.
  - Rank prioritized subdimensions or priority topics.
  - Use CMF tables of descriptions across four levels of capability.
- Consider questions—Business process, for example:
  - Is there a formal planning process for the TMS?
  - Is TMS planning aligned with broader TSMO planning?
  - How are TMS projects funded?
  - Does the TMS have sufficient documentation that is routinely updated?

Visualizing Current Capability Levels(2)

After current capability levels are assigned for all selected dimensions, use a spider diagram to visualize the results of current capability levels. This information may be used in the following steps to help identify potential improvements.

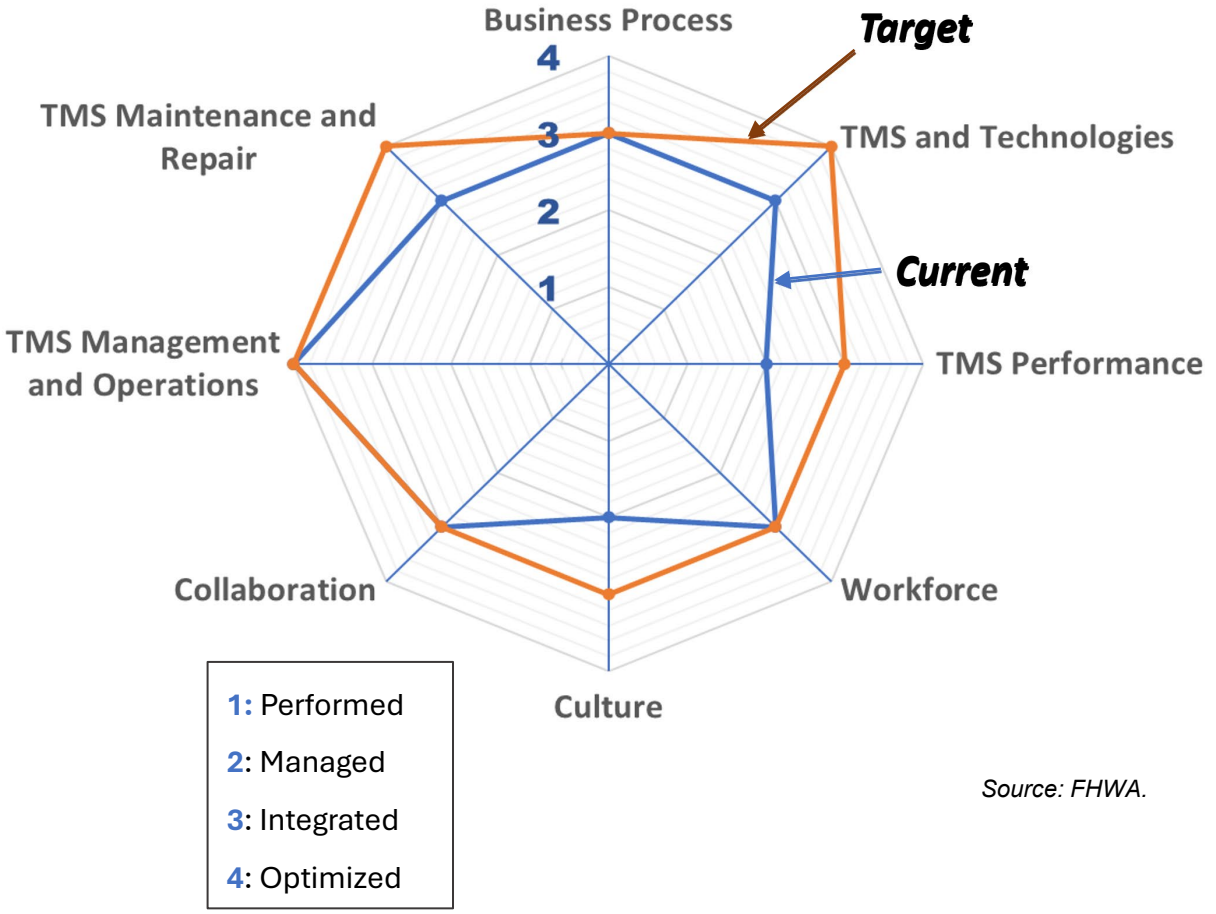


1: Performed
2: Managed
3: Integrated
4: Optimized

Source: FHWA.

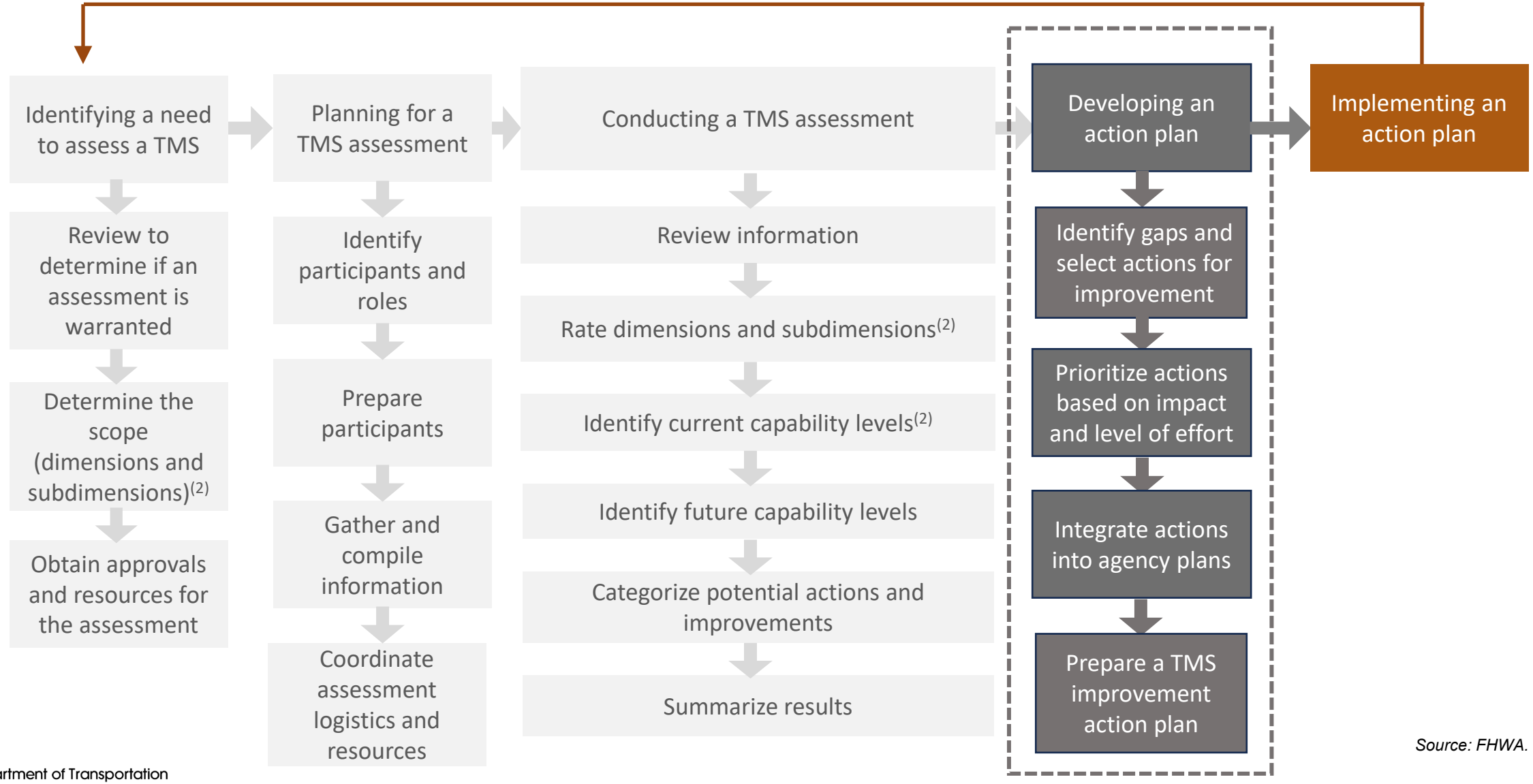
Visualizing Future Target Capability Levels(2)

After current capability levels are assigned for all selected dimensions, use a spider diagram to visualize the results of current capability levels. Add a new line to the same chart with current capability levels. Gaps between the lines represent improvement opportunities.



Source: FHWA.

4. Developing an Action Plan (1/4)



Source: FHWA.

4. Developing an Action Plan (2/4)

- Identify gaps, improvement opportunities, and identified actions.
- Prioritize actions for dimensions and subdimensions:[2]
  - Identify immediately actionable actions or changes.
  - Prioritize improvements that need resources to pursue.
  - Align proposed improvements with agency or regional priorities.
- Integrate actions into other agency plans.
- Combine selected actions into an action plan.

4. Developing an Action Plan (3/4)

The following table is an example of evaluating and prioritizing actions.

Dimension[2]	Action	Value	Risk	Effort	Cost
Workforce	Develop detailed job descriptions for TMS staff	1	7	2	4
Systems and Technologies	Create a joint task force to align technology decisions	2	8	4	8
Culture	Establish agency peer-to-peer exchanges to discuss TMS operations and maintenance	1	5	5	6

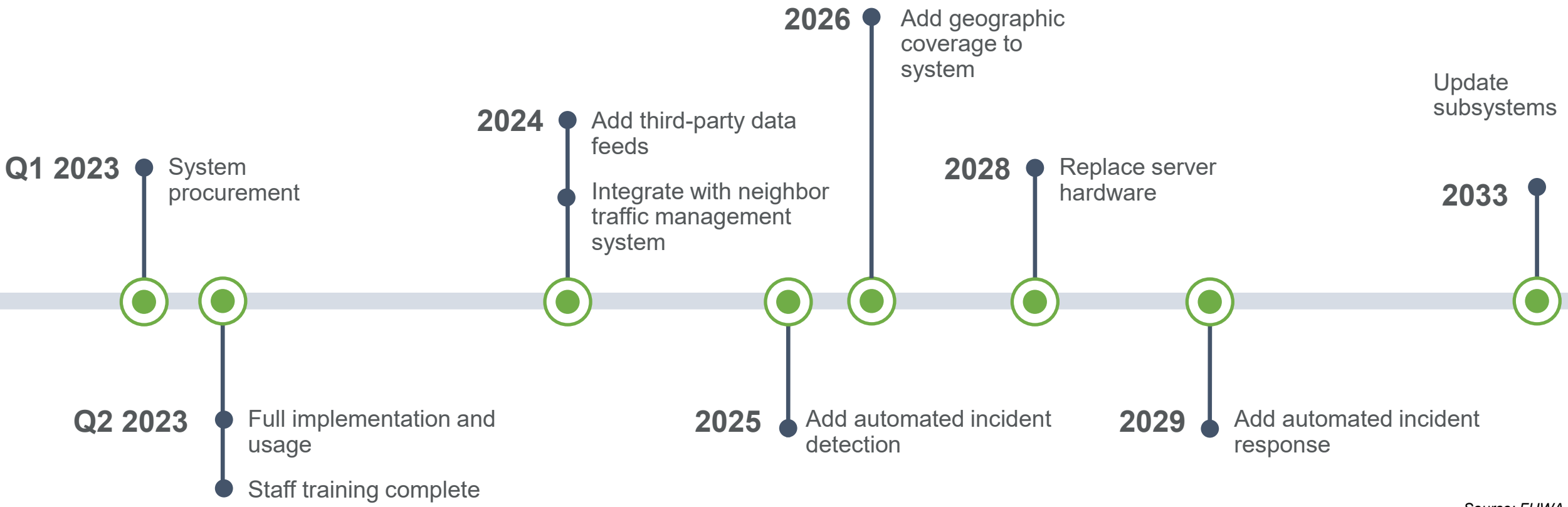
4. Developing an Action Plan (4/4)

Not all target capability levels are immediately prioritized in the action plan.(2) Add a third line to the spider diagram to visualize selected actions for implementation. The new action plan line represents selected actions to implement now, based on available resources and priority.

Source: FHWA.

4. Creating an Action Plan: Feature Roadmap

A TMS feature roadmap contains selected improvements scheduled.



Source: FHWA.

4. Creating an Action Plan: Example Improvements (1/2)

This list contains example improvement opportunities identified in TMS assessments.

- Prepare procedures, control plans, and actions for specific events or scenarios.
- Identify and obtain staff or contract support with the knowledge, ability, and resources to support TMSs.
- Plan for and obtain the resources needed for improvements.
- Develop plans for the next generation of the agency's TMS.
- Develop a staffing plan and obtain resources to improve scheduling staff and support resources to meet the TMS's operational needs.

TMS Resources

- National Operations Center of Excellence (NOCoE) TMS portal.(4)
- TMC Pooled-Fund Study website.(1)
- Next Generation of TMSs resources.(5)

References

1. FHWA. n.d. “TMC Pooled-Fund Study” (web page). https://tmcpfs.ops.fhwa.dot.gov/, last accessed May 6, 2024.
2. FHWA. n.d. “Business Process Frameworks for Transportation Operations: Capability Maturity Frameworks Overview” (web page). https://ops.fhwa.dot.gov/tsmoframeworktool/cmf_overview.htm, last accessed November 7, 2024.
3. Weatherford, M., J. Schroeder, P. Okunieff, and J. Wu. 2024. *Managing Traffic Management System Assets*. Report No. FHWA-HRT-24-088. Washington, DC: Federal Highway Administration. https://highways.dot.gov/sites/fhwa.dot.gov/files/FHWA-HRT-24-088.pdf, last accessed May 6, 2024.
4. NOCoE. n.d. “Resources—Traffic Management Systems and Centers” (web page). https://transportationops.org/traffic-management-systems-and-centers/Traffic-Management-System, last accessed May 6, 2024.
5. NOCoE. n.d. “Next Generation of TMSs” (web page). https://transportationops.org/traffic-management-systems-and-centers/next-generation-tmss, last accessed July 11, 2024.

Questions?

Disclaimer

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

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

Speaker's Notes

Speaker's Notes (1/39)

This presentation aims to introduce the concept of assessing and reporting on traffic management system capabilities and performance

Speaker's Notes (2/39)

Table of contents with slide numbers for each topic covered in this presentation.

Speaker's Notes (3/39)

Resources typically do not exist to support assessing and benchmarking TMS institutional performance.

The performance assessed here primarily focuses on the organization/institution, which is foundational to the performance of the TMS systems, technology, and the execution of operational strategies. This institutional performance directly impacts the overall effectiveness of the TMS.

When assessing a Traffic Management System, agencies face unique considerations:

- Real-time operations: A TMS supports day-to-day traffic management, often in a 24/7 environment.
- Staffing: Dedicated personnel are required to support these continuous operations.
- Procurement: TMS components and subsystems are often acquired through specialized processes.
- Data integration: The system typically ingests multiple data sources and integrates with external applications.
- Asset management: Individual TMS assets require ongoing maintenance and have distinct lifecycles.
- Stakeholder involvement: TMS planning, design, and implementation often involve multiple stakeholders.
- Data sharing: The system may need to share data with external stakeholders, requiring additional considerations.

Speaker's Notes (4/39)

In this slide, we're discussing the concept and importance of assessments in the context of Traffic Management Systems.

An assessment is a tool for organizations to evaluate their current capabilities and performance levels. It's not just a casual review, but a formal, structured process that provides valuable insights.

When conducting an assessment:

1. It's beneficial to use an established process or framework.
2. Involve key stakeholders throughout the assessment. Their input and perspective are meaningful to a comprehensive evaluation.

The outputs of these assessments are practical and actionable. They can be used to:

1. Identify specific enhancements that can improve overall TMS performance.
2. Highlight opportunities for improvement and help build consensus among stakeholders on the necessary changes.
3. Pinpoint immediate priorities that require action or changes in the short term.

The goal of an assessment is not just to gather information, but to use that information to drive meaningful improvements in your TMS operations and performance.

Speaker's Notes (5/39)

This slide highlights the relationship between Traffic Management System (TMS) assessments and other Transportation Systems Management and Operations (TSMO) assessments.

It's important to note that while we're focusing on TMS-specific assessments, agencies often conduct various other assessments to support their TSMO programs. These might include evaluations of active traffic management, traffic incident management, planned special events, and others listed on the slide.

The key takeaway here is that there are significant similarities across these different types of assessments:

1. They follow a similar process and approach.
2. The discussions and considerations often overlap.
3. They all share six main dimensions or process improvement areas, which are listed on the right side of the slide.

These six dimensions - Business Process, Systems & Technology, Performance Measurement, Workforce, Culture, and Collaboration - form the backbone of any comprehensive TSMO assessment, including TMS assessments.

For agencies that have experience with other TSMO assessments, you'll find the TMS assessment process familiar. The framework and approach are consistent, which can make the TMS assessment more intuitive and easier to implement.

Speaker's Notes (6/39)

This slide outlines the key reasons why assessing TMSs may be considered by transportation agencies:

1. Assessment provides valuable insights:
   - We can evaluate how effective and reliable our systems are
   - It shows us how well we're managing and operating our TMS
   - We can understand the impact of our operational decisions
   - It gives us a clear picture of our TMS asset conditions
   - We can identify ways to continuously enhance our capabilities
2. These assessments serve as a foundation for improvement:
   - They help us refine our management and operational strategies
   - We can spot opportunities to boost TMS performance
   - It establishes a baseline for measuring future progress
   - Assessments help us engage with stakeholders and justify resource allocation
   - We can improve our asset management approaches
   - It allows us to identify and prioritize necessary upgrades

Speaker's Notes (7/39)

TMS day-to-day:

- Maintenance, repairs, and asset management
- Operation (e.g., center, performance (e.g., monitoring, evaluation, and reporting), active management)
- IT, security, emergencies, and support other systems (e.g., remote operations)

Staffing to support TMSs (e.g., plans, policies, resources, scheduling, contractors)

Policies, procedures, and tools to support managing and operating TMS

Inclusion of TMS plans, requirements, and resources into agency or TSMO policies, programs, plans, initiatives, services, or efforts

Planning, design, development, and implementation of TMS

Planning and plans for an agency's next generation of TMS or improvements

Speaker's Notes (8/39)

This slide illustrates how we've expanded the traditional assessment framework to better suit the unique needs of Traffic Management Systems (TMSs).

Traditionally, AASHTO and FHWA have identified six dimensions for conducting assessments in transportation operations. These dimensions, listed in the 'Existing Dimensions' section, provide a solid foundation but don't fully capture the specialized aspects of TMSs.

To address this gap, we've identified three additional dimensions that are particularly relevant to TMS assessments:

1. Management & Operation: This focuses on the day-to-day management and operation of TMSs, including real-time decision-making and response.
2. Maintenance & Repair: This dimension addresses the ongoing maintenance and repair needs specific to the TMS and TMS assets.
3. Sharing of Data: This covers the unique challenges and opportunities in data sharing and utilization, both within the TMS and with external partners.

These additional dimensions are meaningful because they reflect the operational reality of TMSs, which require ongoing management, maintenance, and data exchange to function effectively.

It's important to note that while we're building on existing assessment methodologies, this approach is specifically designed to address the unique characteristics of TMSs, going beyond general program assessments.

Speaker's Notes (9/39)

This slide illustrates the processes and activities that support both the ongoing management and the evolution of Traffic Management Systems (TMSs). It highlights how these TMS-specific processes interact with broader agency, TSMO, and regional programs, plans, and activities.

The circular diagram shows TMS Management and Operations at the center, surrounded by seven interconnected processes. Each process is linked to external activities or resources, demonstrating how TMS management both informs and is informed by wider organizational strategies.

Key points to note:

- The framework can be entered at any point, depending on an agency's TMS program maturity.
- It emphasizes the cyclical and interconnected nature of TMS management and evolution.
- The outer text boxes show how each process relates to broader agency or regional activities, highlighting opportunities for integration and information sharing.

This framework underscores the importance of aligning TMS processes with overall agency goals, TSMO strategies, and regional ITS architectures, ensuring a comprehensive and coordinated approach to traffic management.

Speaker's Notes (10/39)

Nine dimensions for TMS assessment process, including example sub-dimensions or topics to consider within each dimension

Includes the 6 existing dimensions common to all other TMSO CMFs. Also introduces three new dimensions specific to assessing TMSs, as described on the previous slide.

This slide groups the TMS assessment dimensions into two broader categories:

- Planning and Operational Focused Dimensions
- More technically focused dimensions

Each individual bullet point represents a potential sub-dimensions within the broader dimension.

Speaker's Notes (11/39)

Capability levels are a valuable tool for assessing Traffic Management Systems (TMS):

Assessment purpose:

- Helps agencies determine their current TMS capabilities
- Identifies opportunities for improvement across different dimensions

Structure of capability levels:

- Four distinct levels of maturity: Performance, Managed, Integrated, and Optimized
- Each level represents increasing sophistication and effectiveness in TMS operations

Components of capabilities:

- Processes: From ad hoc to fully documented and optimized
- Staff: From champion-driven to formal training and accountability
- Performance measurement: From limited to comprehensive and improvement-focused
- Organizational alignment: From informal to fully integrated with formal partnerships

Speaker's Notes (11/39) (continued)

Application in assessment process:

- Agencies can use these levels to benchmark their current status
- Helps in setting realistic goals for advancement
- Provides a roadmap for systematic improvement of TMS operations

AASHTO framework:

- AASHTO has developed a comprehensive Transportation Systems Management and Operations (TSMO) Capability Maturity Model
- This model provides detailed descriptions of each maturity level across various dimensions
- It serves as a valuable resource for agencies looking to assess and improve their TMS capabilities

Speaker's Notes (12/39)

The TMS (Traffic Management System) assessment process consists of five key phases:

1. Identifying Need to Assess TMS:
   - Review if an assessment is warranted
   - Determine scope (dimensions and subdimensions)
   - Obtain approvals and resources for the assessment
2. Planning for a TMS Assessment:
   - Identify participants and roles
   - Prepare participants
   - Gather and compile information
   - Coordinate assessment logistics and resources
3. Conducting a TMS Assessment:
   - Review information
   - Rate dimensions and subdimensions
   - Identify current capability levels
   - Identify target future capabilities
   - Categorize potential actions and improvements
   - Summarize results
4. Developing an Action Plan:
   - Identify gaps and select actions for improvement
   - Prioritize actions based on impact and level of effort
   - Integrate actions into agency plans
   - Prepare TMS Improvement Action Plan
5. Implementing Action Plan:
   - This phase completes the cycle, potentially leading back to identifying new needs for assessment

This systematic process enables agencies to thoroughly evaluate their TMS, identify areas for improvement, and develop targeted action plans to enhance their capabilities. The cyclical nature of the process, as indicated by the arrow from "Implementing Action Plan" back to "Identifying Need to Assess TMS," suggests that this is an ongoing process of continuous improvement.

Speaker's Notes (13/39)

Diving into an example assessment. Start with understanding the dimension

Showing the Systems and Technology assessment as an example.

The next three slides will be part of the same example.

Comparing current capabilities for system and tech mixed in with current issues and challenges impacting systems and technologies.

Speaker's Notes (14/39)

Continuing same example, this table shows example descriptions of a dimension in the first column.

And examples of level of capability definitions for 1 – 4.

Agencies performing a self assessment will utilize tables like this to guide their assessment process, in defining current and target capability levels across dimensions.

Descriptions generally follow the base four capability level descriptions. Agencies may choose to emphasize specific aspects of systems and technologies in their individual assessment.

Later we will discuss the concept of subdimensions which will further guide specific assessments.

Speaker's Notes (15/39)

This slide focuses on the Systems and Technologies dimension of TMS capability assessment, building on the capability levels discussed in the previous slide.

When assessing the current capability level for Systems and Technologies, agencies should consider various aspects of their approach to planning, building, and maintaining their TMS:

- The list provides key issues to evaluate when determining the current capability level.
- These topics help agencies analyze the gap between their current state and desired future capabilities.
- Each item on the list represents a subdimension within the Systems and Technologies dimension.
- Agencies should discuss how they address these issues in their current practices.
- This analysis helps in identifying where the agency stands on the four-level capability scale for each subdimension.
- Understanding the current level is crucial for setting realistic goals and identifying areas for improvement.

By systematically examining these issues, agencies can gain a comprehensive view of their current Systems and Technologies capabilities, which is essential for developing targeted improvement strategies.

Speaker's Notes (16/39)

After identifying where their current capability level, the agency can select and prioritize future actions to improve upon these capabilities.

Speaker's Notes (17/39)

Each dimension, and sub-dimension would be accompanied by a table of "actions to advance capabilities" similar to existing CMMs.

Speaker's Notes (18/39)

Simple definitions for each of the 4 levels of capability across the first 3 dimensions of the TMS CMF:

- Business processes
- Systems and Technologies
- Performance Measures

Speaker's Notes (19/39)

Simple definitions for each of the 4 levels of capability across the first 3 dimensions of the TMS CMF:

- Business processes
- Systems and Technologies
- Performance Measures

Speaker's Notes (20/39)

Simple definitions for each of the 4 levels of capability across the first 3 dimensions of the TMS CMF:

- Business processes
- Systems and Technologies
- Performance Measures

Speaker's Notes (21/39)

What processes will be followed to assess and document results?

Who should be included in the process or provide reviews?

What data and information may need to be collected or compiled?

Review FHWA capability maturity framework and tools (e.g., TSMO, Traffic Management, Active Traffic Management) and agree on process to follow

What resources may be needed to do the following?

- Prepare for and manage the assessment
- Compile data and information needed
- Conduct analyses required
- Facilitate stakeholder involvement or reviews
- Compile results, identify areas for improvements, and create action plan

Identify TMS specific topics to include in the assessment:

- Not included in current framework and tool
- Compile information specific to each TMS topic to include in assessment
- Incorporate TMS topics and provide examples and information to support the assessment of the topic
- Compile data and information for all topics to be included in the assessment of each process

Speaker's Notes (22/39)

The TMS (Traffic Management System) assessment process consists of five key phases:

1. Identifying Need to Assess TMS:
   - Review if an assessment is warranted
   - Determine scope (dimensions and subdimensions)
   - Obtain approvals and resources for the assessment
2. Planning for a TMS Assessment:
   - Identify participants and roles
   - Prepare participants
   - Gather and compile information
   - Coordinate assessment logistics and resources
3. Conducting a TMS Assessment:
   - Review information
   - Rate dimensions and subdimensions
   - Identify current capability levels
   - Identify target future capabilities
   - Categorize potential actions and improvements
   - Summarize results
4. Developing an Action Plan:
   - Identify gaps and select actions for improvement
   - Prioritize actions based on impact and level of effort
   - Integrate actions into agency plans
   - Prepare TMS Improvement Action Plan
5. Implementing Action Plan:
   - This phase completes the cycle, potentially leading back to identifying new needs for assessment

This systematic process enables agencies to thoroughly evaluate their TMS, identify areas for improvement, and develop targeted action plans to enhance their capabilities. The cyclical nature of the process, as indicated by the arrow from "Implementing Action Plan" back to "Identifying Need to Assess TMS," suggests that this is an ongoing process of continuous improvement.

Speaker's Notes (23/39)

A snapshot of the entire TMS assessment process from beginning to end.

We will cover each phase (represented by a column) moving forward

Tips to consider before starting the assessment. To ensure a successful assessment.

Speaker's Notes (24/39)

Phase 1

A snapshot of the entire TMS assessment process from beginning to end.

We will cover each phase (represented by a column) moving forward

During preparation and planning in support of conducting a TMS assessment, it is useful for an agency to identify the project lead and an executive champion. The lead for the assessment may coordinate and manage all activities leading up to conducting the actual assessment. A small group may be assembled to support the lead to develop the concept of the assessment, determining its scope, the outcome sought, and deciding who should be involved. The executive champion may provide management support and alignment withing the larger organizational structure.

Speaker's Notes (25/39)

The following list provide a sample of relevant policies and procedures to prepare before an assessment:

- Strategic goals and plans
- Regional plans
- ITS strategic plans
- Regional ITS architectures
- TSMO plans
- Results of previously conducted assessments, if available, and action plans
- Condition of TMS assets, performance measures, and dashboards
- Traffic signal timing
- Agency staff and training programs
- Funding/grant programs
- ATM traffic management plans
- TMS plans
- MOUs
- Agency and project charters

Speaker's Notes (26/39)

Moving to the actual assessment now

This is the part that is most familiar to those who have gone through a CMF process before. This is where you are assigning current capability levels, having discussions as a group, and starting to get an idea of where you would like to improve in the future.

- Review selected information
- Rate selected dimensions and subdimensions through discussions with all stakeholders
- Identify current capability levels
- Identify target future capability levels
- Categorize and prioritize potential actions and improvements
- Summarize and document results

Speaker's Notes (27/39)

In order to determine the most appropriate level of maturity, it is advisable to gather feedback from a broad range of stakeholders as well as utilize factual evidence to support the analysis. Often facts are not more important than opinions, and the way that the TMS program is perceived by stakeholders may influence the assessment results and action plans. For example, data may show that the TMS group performs at a level of higher maturity than is recognized by other stakeholders. This may trigger the nee to formulate actions that will better align ground truth and stakeholder perceptions.

Speaker's Notes (28/39)

Assigning scores for each dimension

Each dimension score can be the most common score from the sub-dimensions in this dimension

This spider diagram is a helpful way to visualize results of current capability levels

Speaker's Notes (29/39)

After selecting target improvements, we can update our spider diagram to include a new element — now we have both current and target capability levels, across each dimension, visualized

With the current capability level as one line and the target capabilities as a second line, gaps are apparent between the line, representing potential opportunities for improving capabilities.

Speaker's Notes (30/39)

A snapshot of the entire TMS assessment process from beginning to end.

We will cover each phase (represented by a column) moving forward

1. **Reviewing TMS-CMF**
   - First, understand the TSMO CMM, as an overview of how the model and CMF process works.
   - Decide if the agency is able and willing to perform a full self-assessment.
   - If so, review the TMS CMF dimensions and subdimensions. Decide which of the dimensions and subdimensions are important to the agency
2. **Planning and Preparing for a TMS Assessment**
   - Define internal and external stakeholders and participants and their expected roles.
   - Train each participant on their role and the overall process.
   - Gather any data, documents, plans, etc.
   - Prepare logistics for the assessment discussions. Rooms, dates, agendas, documentation, etc.
3. **Conducting a TMS Assessment**
   - Compile and prepare the information to support the assessment
   - Review, with the entire team, all dimensions and subdimensions to avoid overlapping discussions and guide each conversation.
   - Identify and score current capability levels
   - Compile information to capture notes, capability levels, discussion points, future goals, etc.

Speaker's Notes (30/39) (continued)

4. **Analyzing results**
   - Identify and prioritize possible future improvements for each dimension.
   - For prioritized improvements, identify important subdimensions.
   - Rank subdimensions and improvement actions within subdimensions.
   - Document results, layering on previous documentation. The agency should have both current and target capability levels documented at this point.
5. **Creating an action plan**
   - Identify gaps between current and target capabilities.
   - Review potential actions the agency can take to improve capabilities.
   - Prioritize possible improvements — some may overlap or support other agency plans, for example.
   - Identify any demands or needs of resources to achieve desired improvements.
   - Combine all selected actions into an improvement action plan.
6. **Implement action plan and monitor results.**
   - Begin a new assessment when necessary, possibly with a new scope or focus.

Speaker's Notes (31/39)

Before setting targets, the agency may benefit from reading and understanding the capability maturity level descriptions for each dimension and subdimension. Once the key staff understand the intent behind each of these dimensions and levels, they may be better able to make informed decisions about setting target capability levels as an agency.

The criteria for prioritization of actions to be included in the action plan may include the following considerations:

- Value: How likely will this action help elevate the capability level if done correctly?
- Risk: What is the risk in taking on this action? Will the agency be able to successfully execute this action with a low probability of negative impacts on the agency?
- Effort: Required resources (e.g., number of staff and hours required)
- Cost: Level of expenditure or investment to execute this action.
- Timeframe: How soon can this action be executed? (e.g., immediate, near-term, or long-term)

Gap analysis entails review of all identified actions for each subdimension and dimension and evaluating if the prioritized set of actions are sufficient to accomplish the advancement to the next level for that subdimension or dimension

Speaker's Notes (32/39)

To begin prioritizing actions based on these criteria an evaluation and prioritization matrix can be used to enumerate actions and their value, risk, effort, and cost scores. Depending on the agency's overall goals and environment, these scores could be weighed accordingly. For example, an agency with a healthy budget allocation for advancement to the next level may put more weight on value or risk criteria than cost. This slide shows an example of evaluation and prioritization matrix using a non-weighted 1 to 10 scoring scale, where 1 is the lowest and 10 is the highest level of value, risk, effort, or cost.

Speaker's Notes (33/39)

Once agreeing on which actions, across each dimension, are worth pursuing, the agency can create an action plan with these selected actions.

Note: not all actions are worth pursuing AT THIS TIME, even though the future target capability may be higher.

Speaker's Notes (34/39)

Example roadmap of TMS improvements, scheduled into the future. Another way to visualize TMS improvements.

This roadmap represents the incremental nature of improvements. Sometimes improvements can happen to one subsystem or component. Other times entire systems (eg. next generation) are stood up, replacing old systems.

Speaker's Notes (35/39)

None.

Speaker's Notes (36/39)

None.

Speaker's Notes (37/39)

None.

Speaker's Notes (38/39)

This presentation aims to introduce the concept of assessing and reporting on traffic management system capabilities and performance.

Speaker's Notes (39/39)

None.