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EXECUTIVE SUMMARY

Transportation Systems Management and Operations (TSMO) is an integrated program to optimize the performance of existing multimodal infrastructure by implementing systems, services, and projects to preserve capacity and improve the security, safety, and reliability of the transportation system. Most agencies have some level of a TSMO program, the issues for today's transportation agencies are how to formalize and document this program as a TSMO program plan and how to advance the practice by further formalizing the program. This project, *Transportation Systems Management and Operations Program Planning—Experiences from the SHRP 2 Implementation Assistance Program* (NCHRP 20-07 Task 365), advanced a series of related goals and objectives; chief among them were:

- To document the experiences, lessons learned, challenges, and best practices in transportation systems management and operations (TSMO) program planning efforts to-date;
- To capture the progress of agencies that participated in the TSMO capability maturity model (CMM) workshops, supported by the second Strategic Highway Research Program (SHRP 2);
- To evaluate the TSMO program planning framework previously developed in NCHRP 20-07 (345) (*Program Planning and Development for TSMO in State Departments of Transportation*) in the context of these experiences; and
- To produce a Unified TSMO Program Planning Framework for State and regional transportation agencies that has been validated by the above task outcomes and reflects agency experiences.

The project approached these goals and objectives with a two-pronged methodology. First, the project distributed a national survey on TSMO program planning efforts to a broad cross-section of TSMO professionals working at public transportation agencies across the United States. The overall goal of the survey was to capture a wide range of experiences, lessons learned, challenges, and best practices from transportation agencies spanning all stages of the TSMO program planning process. Additionally, the survey included direct questions on agency applications of both the Capability Maturity Model (CMM) workshop outputs and the NCHRP 20-07 (345) framework. In consideration of the evolving nature of TSMO program planning, many questions in the survey were phrased to indicate that the survey sought the individual perspectives and experiences of agency TSMO professionals, which did not necessarily need to represent any official agency positions.

Second, the project team organized a workshop for NCHRP 20-07 Task 365 panel members and TSMO leaders from State Departments of Transportation (DOTs) and Metropolitan Planning Organizations (MPOs). The overarching goal of the workshop was to collectively evaluate and validate the earlier TSMO program planning frameworks (the NCHRP 20-07 (345) and CMM frameworks). These frameworks were developed while agencies were largely in the nascent stages of TSMO program planning. Now that many agencies have matured in their TSMO program planning—whether they are implementing their plans, developing their plans, or preparing to plan—the workshop provided an important opportunity to collectively vet and refine these frameworks to ensure they reflect best practices from agencies' real-world experiences. The workshop also included a presentation of the results of the national survey on TSMO program planning so that those experiences and perspectives could be integrated into the discussion and validation of the ensuing Unified TSMO Program Planning Framework.

This Final Report captures the results of all the above research, and synthesizes it to validate and create a Unified TSMO Program Planning Framework that incorporates the findings from:

- The NCHRP 20-07 (345) framework;
- The CMM workshop outputs and accompanying implementation plans;
- The national survey on TSMO program planning efforts; and
- The NCHRP 20-07 Task 365 workshop for panel members and agency representatives.

As a resource for TSMO program planning, the Final Report is intended to provide TSMO professionals with the most up-to-date information on experiences, lessons learned, challenges, and best practices. The Unified TSMO Program Planning Framework (reproduced below and discussed in detail in Chapter 5) is designed to help agencies develop and implement TSMO program plans as efficiently and effectively as possible, independent of their level of TSMO maturity. The research that went in to the Unified Framework (listed above) is also thoroughly documented in this report, in the chapters leading up to Chapter 5. In this quickly evolving field, the prompt, broad dissemination of all this information is expected to significantly enhance the state and practice of TSMO across the U.S., resulting in measureable improvements in our nation's transportation systems with respect to efficiency, mobility, safety, and cost-effectiveness.

Final Unified TSMO Program Planning Framework

The report's key result is the Unified TSMO Program Planning framework, shown in full below (Table E-1), which synthesizes the findings of all project research activities. The high-level components of the Unified TSMO Program Planning Framework are listed and described in detail in the first column of Table E-1, identified by the labels A through H. There is also an unlabeled foundational prerequisites component in the first row that establishes a foundation for the rest of the Unified TSMO Program Planning Framework, but does not contribute directly to any contents of the resultant TSMO Program Plan itself. The second column of Table E-1 then lists several key process steps (not exhaustive) that are expected to occur in the development of each component of the framework. The third column lists the related chapters and topics of the actual TSMO Program Plan (the "program plan elements") resulting from these process steps (labeled by the numbers 1-23). The distinction between process steps and program plan elements for each component in the Unified TSMO Program Planning Framework reflects and formalizes the project's key finding that TSMO program planning processes need to be integrated into the framework along with elements/contents of the actual TSMO Program Plan. The entire Unified Framework (meaning the components, process steps, and program plan elements) is designed to be flexible, with the expectation that agencies will tailor each aspect to best fit their individual needs.

Moving Forward

Finally, the project packaged relevant findings from the survey and the workshop into a series of recommendations for how agencies can move forward with the Unified TSMO Program Planning Framework (documented in Chapter 6). These recommendations include strategies for TSMO outreach and advocacy; securing funding and other resources; engaging in peer exchanges; and maintaining a TSMO program plan over time. The aim of these recommendations is to help equip agencies with the support and resources needed to successfully develop, implement, and maintain a TSMO program plan using the Unified TSMO Program Planning Framework.

Table E-1. An overview of the Unified TSMO Program Planning Framework

Framework Component	Anticipated Process Steps (not exhaustive)	Sample TSMO Program Plan Elements
<p>Foundational prerequisites – Laying the groundwork to ensure the TSMO Program Plan development process is properly scoped and supported, including staff support, time and resource commitments, and leadership endorsement. This component involves identifying the core team and ensuring that a feasible management plan is in place to govern the rest of the framework and steps.</p>	<ul style="list-style-type: none"> • Identify TSMO champion(s). • Get commitments from key staff and stakeholders (the full framework and process can be expected to take 1-2 years to fulfill). • Appoint staff or organizations for TSMO Program Plan development responsibility (typically led by operations divisions). • Establish TSMO Program Plan steering committee. • Secure the authority to make changes necessary for the successful design and implementation of the TSMO Program Plan. 	N/A
<p>A. Mission, Vision, Goals, and Objectives – Establishing the high-level outcomes and setting expectations for the plan, to provide a common, clear direction for all of the components and steps that follow. This component ensures that all stakeholders and partners are like-minded in the understanding of what TSMO and the program plan will do, why it is necessary, and how it will benefit each entity.</p>	<ul style="list-style-type: none"> • Achieve consensus on goals, objectives, scope, schedule, budget. • Outreach to Agency Leadership, internal staff, and the public. • Outreach to decision-makers, stakeholders, partners. • Update mission/vision to align with TSMO. • Define TSMO. • Define role of TSMO. Program Plan in context of other planning documents. 	<ol style="list-style-type: none"> 1. Consensus set of goals, objectives, and vision for TSMO. 2. Definition of TSMO (including scope and role, including in the context of other plans).
<p>B. Performance Measurement – Sets context for TSMO and the Program Plan, and gives greater definition to the high-level goal outcomes already established. This component provides tangible descriptions of the current state and goal state.</p>	<ul style="list-style-type: none"> • Select performance measures and targets • Assess existing conditions. • Identify performance reporting strategies. • Set priorities. 	<ol style="list-style-type: none"> 3. Presentation of performance targets and priorities. 4. Characterization of current conditions.

Framework Component	Anticipated Process Steps <i>(not exhaustive)</i>	Sample TSMO Program Plan Elements
<p>C. Leadership, Organization, and Staffing – Addresses foundational staff structure requirements necessary to support TSMO, thereby enabling the successful implementation of various operational and management strategies as they are adopted. This component ensures that technical and administrative support for TSMO is available at all levels of the organization.</p>	<ul style="list-style-type: none"> • Outreach to Agency Leadership, internal staff. • Identify potential institutional improvements. • Identify and implement strategies to promote TSMO culture. • Develop staff retention strategies/programs. • Define overall staffing plan and organization. 	<ol style="list-style-type: none"> 5. Description of career development plans for TSMO staff. 6. Description of staff organization and reporting structure. 7. Formal statement of endorsement from leadership.
<p>D. Business Processes and Planning – Performs key integration of TSMO considerations into existing institutional processes, for systematic treatment according to well defined and documented procedures. Current shortcomings of agency processes regarding TSMO concepts are identified and addressed in this step.</p>	<ul style="list-style-type: none"> • Integrate TSMO into planning processes. • Document agency TSMO practices, methods. • Develop or adjust business processes to include TSMO. • Identify procedural improvements for data-driven planning. • Integrate TSMO into Maintenance planning 	<ol style="list-style-type: none"> 8. Discussion of updates to planning processes (including programming, maintenance, project prioritization, etc.) to include TSMO and performance measures. 9. Documentation of agency practices for ensuring proper consideration of TSMO.
<p>E. Resource Positioning and Development – Defines the technical and financial resources available and required to support the high-level general format and needs of TSMO services and projects, such as data systems, infrastructure, and funding sources. For any needs that are not yet met, this component quantifies the gaps between the present and future goal states, and develops implementable strategies to address them.</p>	<ul style="list-style-type: none"> • Outreach to Agency Leadership, internal staff. • Develop data standards/guidelines. • Conduct inventory and gap analysis of agency resources. • Identify and implement funding strategies. • Update and apply ITS architecture. • Identify required resources and investments. • Conduct inventory of data. 	<ol style="list-style-type: none"> 10. Description of current data resources, standards, and support systems. 11. Documentation of TSMO inventory. 12. Identification of resource gaps and needs. 13. Discussion of current, anticipated future, and potential future funding sources. 14. Presentation of updated ITS Architecture to accommodate needs of TSMO.

Framework Component	Anticipated Process Steps <i>(not exhaustive)</i>	Sample TSMO Program Plan Elements
<p>F. Services and Projects – Develops a set of tangible initiatives and solutions in pursuit of the performance targets and goals/vision set earlier, subject to any inflexible practical constraints identified as part of previous framework components. Depending on the outcomes from this framework component, it may be necessary to revisit and update previous components to some degree.</p>	<ul style="list-style-type: none"> • Outreach to stakeholders and partners. • Implement TSMO services/projects. • Identify/Prioritize strategies to implement TSMO improvements. 	<p>15. Describe services and projects to meet TSMO goals and objectives.</p> <p>16. Map services and projects to resource needs (including funding), performance targets, and relevant staff (including roles).</p> <p>17. Develop implementation plan (e.g., phases, initial steps, near-term goals) for services and projects.</p>
<p>G. Roles and Responsibilities – Covers the required staff support elements of the services and projects from the previous component, including considerations of training, policies, and formal documentation. This component applies to staff both internally and at partner agencies/organizations.</p>	<ul style="list-style-type: none"> • Outreach to stakeholders, partners, and internal staff. • Define roles, responsibilities, position requirements. • Develop Staff Training Strategies/Programs. • Establish MOUs with partners regarding data sharing, resource sharing, incident management, etc. 	<p>18. Documentation or summaries of MOUs with partner agencies to support various services and projects.</p> <p>19. Description of staff roles and responsibilities with respect to TSMO business processes, services, and projects.</p> <p>20. Description of training program(s) for TSMO staff.</p>
<p>H. Evaluation and Reassessment – Ensures that the services and projects are effective at realizing progress toward the goals and targets established previously, and captures mechanisms and methods for ongoing monitoring and continual improvement of TSMO and the Program Plan.</p>	<ul style="list-style-type: none"> • Assess existing conditions • Collect postperformance metrics. • Conduct follow-up CMM workshop. • Outreach to decision-makers, stakeholders, partners, public. • Establish reporting requirements and procedures. 	<p>21. Plan for ongoing performance measurement and reporting.</p> <p>22. Discussion of schedule or trigger for next CMM evaluation.</p> <p>23. Schedule and staff responsibilities for updating TSMO Program Plan.</p>

CHAPTER 1

Introduction

Transportation Systems Management and Operations (TSMO) is an integrated program to optimize the performance of existing multimodal infrastructure by implementing systems, services, and projects to preserve capacity and improve the security, safety, and reliability of the transportation system. Most agencies have some level of a TSMO program, the issues for today's transportation agencies are how to formalize and document this program as a TSMO program plan and how to advance the practice by further formalizing the program. This project, Transportation Systems Management and Operations Program Planning – Experiences from the SHRP 2 Implementation Assistance Program (NCHRP 20-07 Task 365), advanced a series of related goals and objectives; chief among them were:

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Second, the project team organized a workshop for NCHRP 20-07 Task 365 panel members and TSMO leaders from State Departments of Transportation (DOTs) and Metropolitan Planning Organizations (MPOs). The overarching goal of the workshop was to collectively evaluate and validate the earlier TSMO program planning frameworks (the NCHRP 20-07 (345) and CMM frameworks). These frameworks were developed while agencies were largely in the nascent stages of TSMO program planning. Now that many agencies have matured in their TSMO program planning – whether they are implementing their plans, developing their plans, or preparing to plan – the workshop provided an important opportunity to collectively vet and refine these frameworks to ensure they reflect best practices from agencies' real-world experiences. The workshop also included a presentation of the results of the national survey on TSMO program planning so that those experiences and perspectives could be integrated into the discussion and validation of the ensuing Unified TSMO Program Planning Framework.

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As a resource for TSMO program planning, the Final Report is intended to provide TSMO professionals with the most up-to-date information on experiences, lessons learned, challenges, and best practices. The Unified TSMO Program Planning Framework (Chapter 5) is designed to help agencies develop and implement TSMO program plans as efficiently and effectively as possible, independent of their level of TSMO maturity. In this quickly evolving field, the prompt, broad dissemination of this information is expected to significantly enhance the state and practice of TSMO across the U.S., resulting in measureable improvements in our nation's transportation systems with respect to efficiency, mobility, safety, and cost-effectiveness.

Organization of the Final Report

The remainder of this report is structured as follows:

- **Chapter 2: Existing TSMO Program Planning Frameworks** – A review of findings from the CMM workshops and implementation plans organized under SHRP 2 and from NCHRP 20-07 (345), which developed an initial TSMO program planning framework.
- **Chapter 3: National Survey on TSMO Program Planning** – A summary of findings from the nation-wide survey of TSMO program planning experiences, lessons learned, challenges, and best practices from State DOTs and regional agencies at varying stages of TSMO maturity and program plan development.
- **Chapter 4: Workshop Objectives and Findings** – A summary of findings from the TSMO workshop to evaluate and validate earlier TSMO program planning frameworks developed through NCHRP 20-07 (345) and the CMM workshops, based on agency experiences and the national survey results.
- **Chapter 5: Synthesis of Findings and the Unified TSMO Program Planning Framework** – Description of the Unified TSMO Program Planning Framework that blends together all of the above findings into a single, comprehensive reference for TSMO program planning that is validated by the findings from the national survey and the workshop.
- **Chapter 6: Moving Forward** – Guidance regarding the application and ongoing maintenance of the Unified TSMO Program Planning Framework, to ensure that it continues to provide agencies and practitioners with current, relevant, and valuable guidance regarding TSMO program planning.
- **Appendix A** – The Unified TSMO Program Planning Framework.
- **Appendix B : Survey Questions** – A full record of the questions included in the national survey on TSMO program planning.
- **Appendix C : Workshop Meeting Minutes** – Summarized record of the discussions that took place at the NCHRP 20-07 Task 365 workshop.

CHAPTER 2

Existing TSMO Program Planning Frameworks

This chapter provides background on the capability maturity model (CMM) workshops and implementation plans organized under the second Strategic Highway Research Program (SHRP 2), and on NCHRP 20-07 (345), which developed an initial transportation systems management and operations (TSMO) program planning framework. Two key objectives of this project were 1) to capture the progress of agencies that participated in the TSMO CMM workshops; and 2) to consider the TSMO program planning framework previously developed in NCHRP 20-07 (345). In consideration of these objectives, an understanding of these two existing TSMO program planning frameworks is essential to the analysis of this project's findings.

Capability Maturity Model to Advance TSMO

Overview

The CMM framework to advance TSMO is based on self evaluation of the key process and institutional capabilities that transportation agencies (or a group of agencies) need to achieve an effective TSMO program. The TSMO CMM framework is an adaptation of the CMM concept from the information technology (IT) industry, and has been tailored to the transportation and TSMO communities to facilitate TSMO program planning and the advancement of TSMO capabilities at an agency or across a set of agencies.

The CMM framework identifies six key dimensions of process and institutional capability that directly relate to improving TSMO program effectiveness, with four levels of capability defined for each dimension. In doing so, the framework converts what were previously fuzzy concepts into clearly defined stages of capability, facilitating the identification of manageable actions for improving those capabilities through a systematic approach.

The CMM process starts with a self-evaluation of the agency's current level of capability in the six key dimensions and – based on the evaluation – provides insight into the types of strategies and actions that may be most effective at addressing the current challenges and weaknesses that are preventing them from reaching the next level of maturity. A set of prioritized actions for improving TSMO capabilities at the given agency are then identified, formally documented, and described in greater detail in a resultant TSMO implementation plan.

Key Dimensions and Levels of Capability

The six dimensions of the CMM framework, and some examples of TSMO activities within each dimension, are:

- **Business Processes** – including formal scoping planning, programming, and budgeting;

- **Systems and Technology** – including systems architecture, standards, interoperability, and standardization and documentation;
- **Performance Measurement** – including measures definition, data acquisition, analysis, and utilization;
- **Culture** – including technical understanding, leadership, policy commitment, outreach, and program authority;
- **Organization and Workforce** – including organizational structure, staff capacity, development, and retention; and
- **Collaboration** – including relationships with public safety agencies, local governments, MPOs, and the private sector.

For each of the six dimensions, there are four discrete levels of agency capability based on observations of actual agency practice. These levels range from unstructured and undocumented activities and processes to more formalized, integrated programs. The levels of capability are used to assess an agency’s current state and to facilitate the identification of the types of improvements that are necessary to achieve meaningful growth in those dimensions. The four levels are briefly defined below.

- **Level 1: Performed** – Activities and relationships are largely ad hoc, informal, and champion-driven; they are substantially outside the mainstream of other transportation activities.
- **Level 2: Managed** – Basic strategy applications in place with key process and needed staff capacities under development, but there is limited accountability, collaboration, sustainable resources for TSMO activities.
- **Level 3: Integrated** – Standardized strategy applications are implemented in priority contexts and managed for performance; TSMO technical systems and processes are developed, documented, and integrated into the regional transportation agencies; partnerships are aligned.
- **Level 4: Optimized** – TSMO activities are part of a full, sustainable, regionwide program, established on the basis of continuous improvement with all partners.

Each of the four levels can be more precisely defined within the context of each of the six dimensions, as detailed in Table 2-1.

Table 2-1. Definition of the current levels of agency capability in each of six CMM dimensions.

Capability Dimension	Level 1	Level 2	Level 3	Level 4
Business Processes	Processes related to TSMO activities are ad hoc and unintegrated.	Multiyear statewide operations and management plan and program exists with deficiencies, evaluation, and strategies.	Programming, budgeting, and project development processes for TSMO standardized and documented.	Processes streamlined and subject to continuous improvement.
Systems and Technology	Ad hoc approaches outside systematic systems engineering.	Systems Engineering employed and consistently used for ConOps, architecture, and systems development.	Systems and technology standardized, documented and trained statewide, and new technology incorporated.	Systems and technology routinely upgraded and utilized to improve efficiency performance.

Capability Dimension	Level 1	Level 2	Level 3	Level 4
Performance Measurement	No regular performance measurement related to TSMO.	TSMO strategies measurement largely via outputs, with limited after-action analyses.	Outcome measures identified and consistently used for TSMO strategies improvement.	Mission-related outputs/outcomes data routinely utilized for management, reported internally and externally, and archived.
Culture	Value of TSMO not widely understood beyond champions.	Agencywide appreciation of the value and role of TSMO.	TSMO accepted as a formal core program.	Explicit agency commitment to TSMO as key strategy to achieve full range of mobility, safety, and sustainability objectives.
Organization and Workforce	Fragmented roles based on legacy organization and available skills.	Relationship among roles and units rationalized and core staff capacities identified.	Top-level management position and core staff for TSMO established in central office and districts.	Professionalization and certification of operations core capacity positions including performance incentives.
Collaboration	Relationships on informal, infrequent and personal basis.	Regular collaboration at regional level.	Collaborative inter-agency adjustment of roles and responsibilities by formal agreements.	High level of operations coordination institutionalized among key public and private players.

CMM Workshops and Self-Assessments

With assistance from SHRP 2, agencies have had the opportunity to assess their current CMM levels and identify relevant strategies for advancement through either tailored in-person CMM workshops with expert facilitators, or CMM materials available on-line through the Federal Highway Administration (FHWA) and the National Operations Center of Excellence (NOCoE) web sites.

During the CMM self-evaluation process, agencies use the criteria in Table 2-1 to evaluate their level of capability in each dimension. The dimension with the lowest level determines the agency's overall level of TSMO program effectiveness. Once an agency has identified its level in each dimension, the CMM framework provides guidance and structure for incrementally advancing the limiting dimensions to the next levels of capability, thereby promoting overall TSMO growth at the agency. General CMM strategies for advancing levels in each dimension are described in Table 2-2.

Table 2-2. General strategies to advance to the next level of capability in each of six CMM dimensions.

Capability Dimension	Level 1 to Level 2	Level 2 to Level 3	Level 3 to Level 4
Business Processes	Establish framework for suitable TSMO-related planning and programming activities.	Develop multiyear statewide TSMO plan and related process improvements.	Integrate new operations objectives and processes into department activities as formalized standard operating procedures.
Systems and Technology	Introduce systems engineering into project development processes.	Develop tools, procedures, and training to support standardized systems engineering process.	Coordinate and update architectural activities with performance measurement on a continuing basis.
Performance Measurement	Identify output and outcome performance measures for the selected operations activities.	Develop data collection and management plan to support utilization of outcome performance measures.	Develop routine performance management process for continuing improvements in operating policies, procedures, systems, and deployments.
Culture	Develop business case for TSMO and continuous improvement of operations performance.	Establish TSMO with a formal core business program status equivalent to other major programs.	Rationalize TSMO program development with other programs on basis of service-related cost effectiveness.
Organization and Workforce	Identify needed adjustments in organizational structure, staffing roles and responsibilities supportive of system management and operations.	Integrate TSMO organization and staff into overall agency structure and clarify reporting relationships.	Create a management and organizational structure for TSMO equivalent to that of other major agency programs.
Collaboration	Establish mechanisms for regular coordination and cooperation.	Execute formal interagency agreement for cooperative approach.	Negotiate effective roles and responsibilities in light of agency priorities, resources, and objectives.

CMM Implementation Plans

The CMM workshops afford agencies the opportunity to craft specific, highly tailored action items for addressing the weaknesses of each dimension, which are then formally documented in resultant TSMO implementation plans. During this process, the greatest emphasis is placed on the dimensions with the lowest levels of maturity. This is crucial, as these lowest-rated dimensions are generally the limiting factors that currently are constraining the agency's TSMO capabilities and achievements. This reflects the finding that each dimension is closely integrated with others in the CMM framework, and all must be effectively practiced as part of a successful TSMO program. Furthermore, improved TSMO performance levels result from synergy among the processes and institutional arrangements that are foundational to many of the dimensions. Actions taken for a given dimension need to produce long-lasting change to the institutional structure, processes, culture, organization, and systems for the maturity levels to see true improvement; therefore, it is typically the case that CMM level improvements require long-term commitments (e.g., for a year) to be successful.

The CMM process provides a mechanism for agencies to assess their strengths and weaknesses, and establishes a basis for TSMO program planning by facilitating the identification of common strategies,

priorities, and action items. The CMM framework is well suited to agencies at all stages of TSMO program maturity in that it emphasizes the ongoing nature of TSMO program planning and facilitates continuous improvement. Some of the most frequently cited action items for improving TSMO capabilities that come out of the CMM process include:

- Developing an official TSMO program plan;
- Integrating TSMO into larger planning processes;
- Creating a comprehensive TSMO performance measurement system ;
- Preparing a series of TSMO business cases, and
- Creating TSMO staffing plans.

Additional CMM Resources

With assistance provided by the SHRP 2 program and with additional support from FHWA and the American Association of State Highway and Transportation Officials (AASHTO), over 23 CMM self-assessment workshops have been conducted. For almost all of these workshops, specific TSMO implementation plan also were developed. The following two resources summarize the experiences and findings from these workshops:

- Executive Summary of the overall program:
<http://www.ops.fhwa.dot.gov/docs/cmmexesum/index.htm>
- White papers that focus on each of the six CMM dimensions are available on-line at:
http://www.ops.fhwa.dot.gov/plan4ops/focus_areas/organizing_for_op.htm

NCHRP 20-07 (345) Framework

NCHRP 20-07 (345), Program Planning and Development for TSMO in State Departments of Transportation, conducted state-of-the-practice research on TSMO program planning in 2014 and produced strategic recommendations for State Departments of Transportation (DOT) to advance TSMO, including a framework for TSMO program planning and development. The project's final report comprehensively documented the state-of-the-practice research (including a review of State DOT web sites, practitioner interviews, workshop findings, and summaries of relevant resources) and provided recommendations on communicating the need for TSMO program planning, potential future research topics, and paths forwards. For the purposes of this project, however, the following summary will focus on the TSMO program planning framework aspect of NCHRP 20-07 (345).

The NCHRP 20-07 (345) framework for TSMO program planning and development includes five main, interrelated components:

- Mission, Vision, Goals, Objectives, and Performance Measures;
- Leadership and Organization;
- Business Processes;
- Resources (Financial, Human, Technology, and Infrastructure); and
- Packages of Services, Projects, and Activities, with Related Policies and Guidelines.

Table 2-3 below presents a recreation of the NCHRP 20-07 (345) Final Report's summary table detailing each component of the framework. As written in the NCHRP 20-07 (345) final report:

“These components should be addressed as part of an ongoing, iterative process that is mutually supportive with other departmental plans and initiatives, builds on established relationships with other TSMO stakeholders, and is adapted to the unique characteristics and circumstances of each DOT. In a particular DOT, some of the framework components may already have been addressed, in whole or in part, by departmental strategic planning or other management initiatives. Likewise, TSMO program planning may be able to provide needed input for other departmental plans or initiatives. The TSMO Program Plan should also build on previous TSMO related plans (e.g., ITS Plan, TIM Plan) and should help implement recommendations from such plans as well as recommendations from CMM workshops, self-assessments, and recommendations from other organizations that share TSMO responsibilities.”

Table 2-3. NCHRP 20-07 (345) Framework for TSMO program planning and development.

Framework for TSMO Program Planning and Development	
TSMO program planning should be an ongoing, iterative process within the context of other departmental plans and initiatives, relationships with TSMO stakeholders, and other strengths, weaknesses, opportunities, and threats. In most DOTs, a primary goal will be to integrate TSMO throughout the department. In parallel, distinct organizational units may have responsibility for specific TSMO services, projects, and activities and for TSMO coordination among other units. Program planning also should address external coordination and collaboration. State DOTs should address these and other overarching issues and questions before attempting a TSMO program plan.	
Component	Description
1. Mission, Vision, Goals, Objectives, and Performance Measures	The program plan should be based on a clear understanding of what the department is trying to accomplish. TSMO goals and objectives and performance measures should be visibly aligned with the department's mission and vision. The lead TSMO unit should have clear mission, vision, etc. The DOT should promote a shared, statewide vision among all TSMO stakeholders.
2. Leadership and Organization	Leadership, organizational responsibilities, and corresponding authority should be well-defined. The program plan should address topics such as department-wide integration of TSMO, responsibilities of key organizational units, interaction with external stakeholders, and mechanisms for setting priorities and making other leadership decisions.
3. Business Processes	The program plan should identify the most important business processes for TSMO success, evaluate each of those processes, and propose improvements to help ensure TSMO success. Some of the processes will be departmental and will need to be adapted or have new variations added. In addition, some entirely new processes may be needed to support TSMO.
4. Resources (Financial, Human, Infrastructure, and Technology)	The available and needed resources should be systematically evaluated for all aspects of the TSMO program. Constraints on those resources and the implications for the TSMO program should be examined, and the program plan should include strategies to improve both the availability and effective use of key resources.
5. Packages of Services, Projects, and Activities with Related Policies and Guidelines	The program plan should broadly identify the packages of TSMO services, projects and activities that would be most effective in accomplishing the DOT's mission, vision, goals, and objectives. The program plan also should enumerate policies and decision-making guidelines for implementation of services, projects, and activities (e.g., warrants, priorities, service levels).

Source: NCHRP 20-07 (345) Final Report.

CHAPTER 3

National Survey on TSMO Program Planning

This chapter provides a summary of findings from the project’s nationwide survey of transportation systems management and operations (TSMO) program planning experiences, lessons learned, and best practices from State Departments of Transportation (DOT) and regional agencies at varying stages of TSMO maturity and program plan development.

Survey Objectives

The overall goal of the national survey on TSMO program planning was to capture a wide range of experiences, lessons learned, challenges, and best practices from transportation agencies at all stages of the TSMO program planning process. The target audiences were TSMO professionals at State DOTs, regional transportation agencies, and Metropolitan Planning Organizations (MPO) across the United States. Private-sector TSMO professionals were not targeted by this survey. The design and distribution of the survey sought to collect as many responses as possible; for example, recipients were encouraged to share the survey with colleagues. In consideration of the evolving nature of TSMO program planning, many questions in the survey were phrased to indicate that the survey sought the individual perspectives and experiences of agency TSMO professionals, which did not necessarily need to represent any official agency position (e.g., question began with “In your opinion...” or “In your experience...”). This approach enabled the survey to most effectively capture a broad range of perspectives and experiences from within a given agency. The entire survey is included in Appendix B.

Survey Responses

A total of 48 survey responses were collected over the approximately six weeks that the survey was active (the survey was active the entire month of January 2016, in addition to two weeks in March in response to requests to reopen and redistribute the survey at the TSMO workshop in February 2016). Of these 48 responses, 40 responses (83 percent) were from State DOT staff at 31 different State DOTs. The remaining eight responses (17 percent) were from eight different regional agencies. Twenty-eight respondents (58 percent) identified as the lead person for TSMO efforts at their agencies, while 20 respondents did not (42 percent). Figure 3-1 below maps out the 31 state and eight regional agencies that contributed to the survey.

Forty-eight individuals contributed to the survey, representing 31 States and 8 regional agencies.

Of the 48 total responses, 36 responses (75 percent) were from individuals working at agencies that were either implementing or developing TSMO program plans – of which 30 worked at State DOTs and six worked at regional agencies (Figure 3-2). Respondents who fell into this category comprised the survey’s “Yes Group” and, after the initial survey questions, were directed to a set of questions designed for agencies working on TSMO program plans. Twelve of the 48 responses (25 percent) were from individuals at agencies that currently were not working towards a TSMO program plan – of which 10 worked at State DOTs and two worked at regional agencies. Respondents in this category comprised the survey’s “No Group” and, after the initial questions, were directed to a set of questions designed for agencies not currently working on TSMO program plans Figure 3-2. Portion of survey responses from agencies that are either implementing or developing TSMO program plans (the Yes Group) and from agencies that currently are not working on TSMO program plans (the No Group).

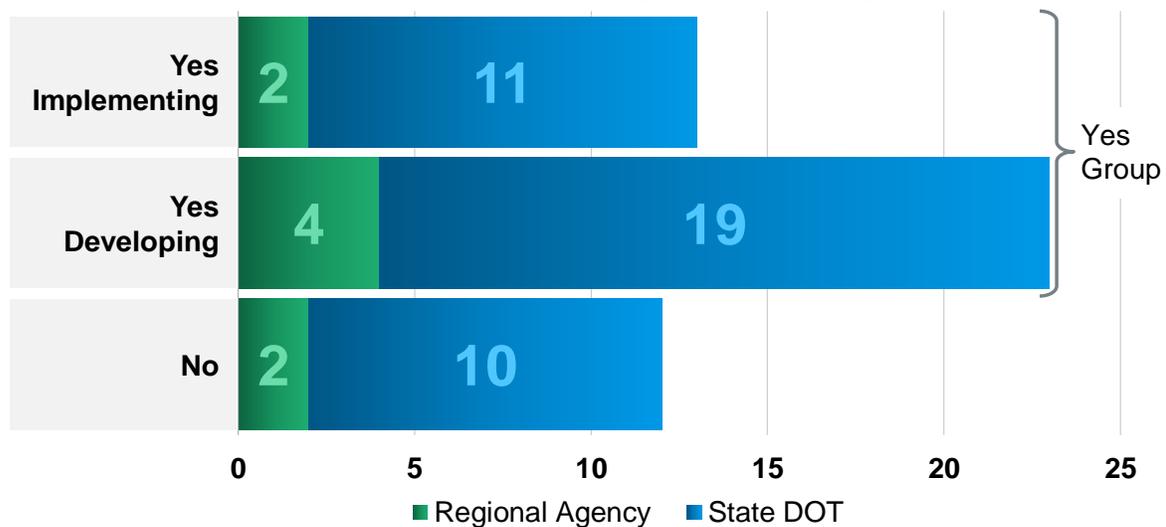


Figure 3-2. Portion of survey responses from agencies that are either implementing or developing TSMO program plans (the Yes Group) and from agencies that are not currently working on TSMO program plans (the No Group).

One important objective of the project’s research was to follow-up with agencies that had received support and guidance on TSMO program planning through the SHRP 2 capability maturity model (CMM) workshops. Of the total 48 survey respondents, 35 (73 percent) worked at agencies that had hosted or participated in CMM workshops (Figure 3-3). Furthermore, 29 of these 35 respondents (83 percent) worked at agencies that were either implementing or developing TSMO program plans. These results indicate both that the CMM workshops effectively advanced TSMO program planning for the majority of agencies participating in this survey and that, due to the large overlap between “Yes Group” respondents and CMM participants, these responses can be used to gage the impacts of the CMM workshops as well.

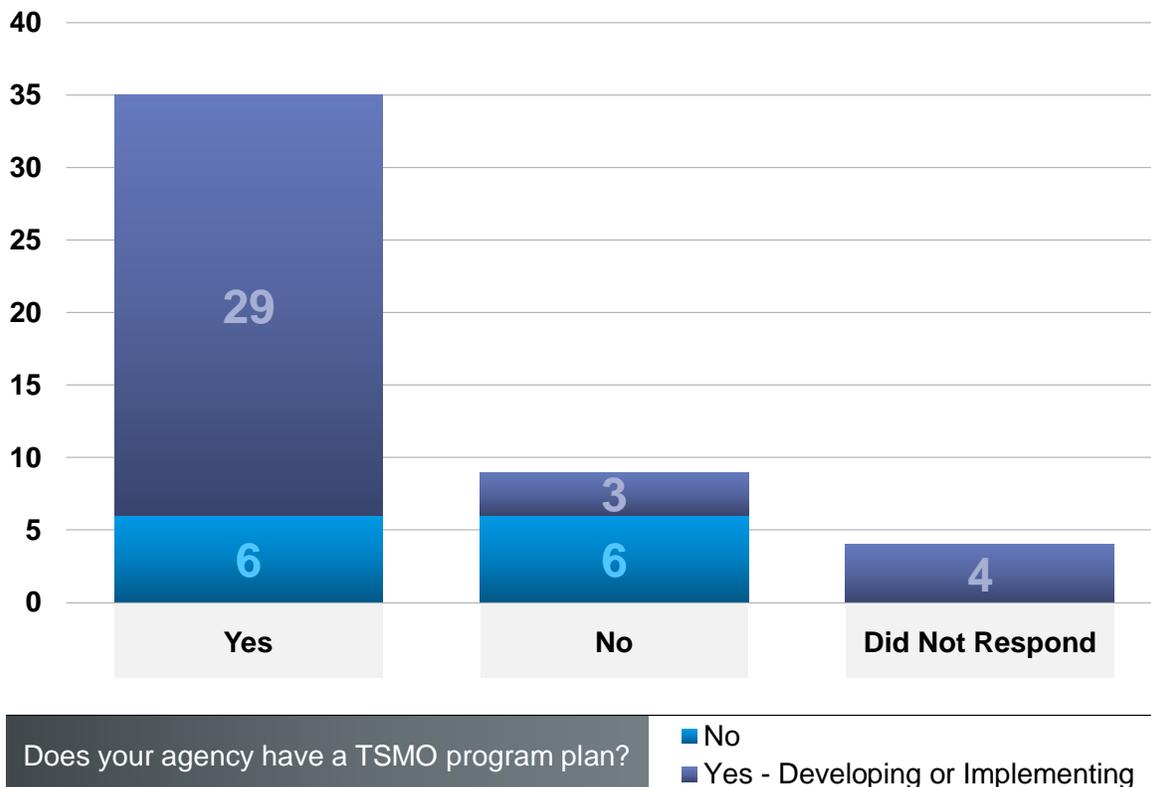


Figure 3-3. Portion of survey responses from agencies that participated in a CMM workshop and that currently are implementing or developing TSMO program plans.

Survey Findings

The “Yes Group”

Survey respondents in the “Yes Group” indicated that their agency either a) had a TSMO program plan and was in the process of implementing it; or b) currently was developing a TSMO program plan or planned to begin the process soon. These respondents received a tailored set of questions for agencies implementing or developing TSMO program plans, the results of which are discussed below. There were a total of 36 respondents in the Yes Group.

Geographic Scope and Timing

The majority of respondents in the “Yes Group” had conducted statewide TSMO program planning. Twenty-one out of 36 (58 percent) had conducted solely statewide planning, with an additional five (an additional 14 percent) having conducted statewide planning with some special focus on urban regions. Seven out of 36 (19 percent) had conducted solely regional TSMO program planning, although all but one of these respondents represented a regional transportation agency. The remaining three respondents indicated that the scope of their agency’s TSMO program planning included multiple plans – with both statewide and regional plans included.

Regarding the start date and duration of TSMO program planning, the results show that TSMO planning activity across the nation generally began in January 2014 with steady increases in the cumulative number of TSMO program plans that had been started since that date (Figure 3-4). Thirty-four respondents (representing 28 different agencies) indicated that their agency will have begun an official TSMO program planning process by July 2016. The survey also showed that the initial, complete TSMO program planning process is taking agencies just over 16 months on average, with a median of 13 months (Figure 3-5). On the faster end, six respondents said their agency spent 6 months and, on the slower end, three respondents said their agency spent 24 months and one respondent said his/her agency spent 48 months. Note that in Figure 3-4, responses have been aggregated to the agency level (i.e., responses from the same agency have been combined); while in Figure 3-5 responses are shown, due to a high level of variation between responses.

Since 2014, many agencies across the U.S. have started TSMO program planning.

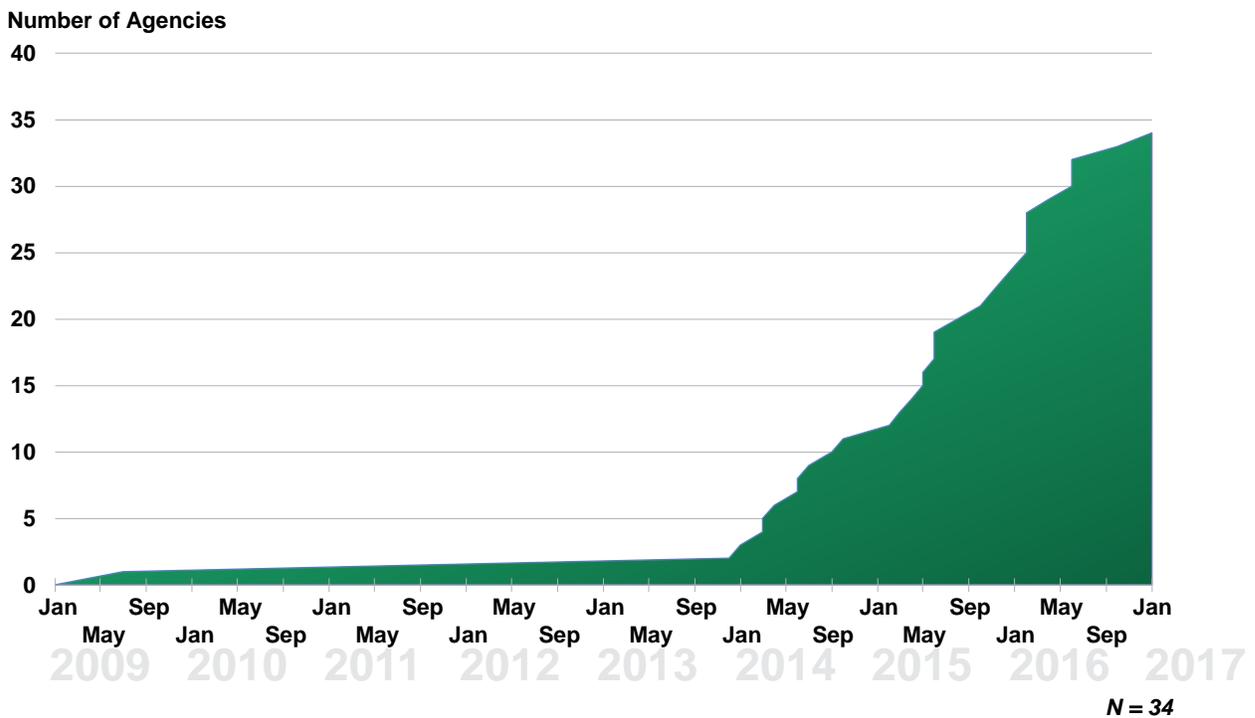


Figure 3-4. Cumulative number of TSMO program planning processes that have been started in the United States (current as of March 2016).

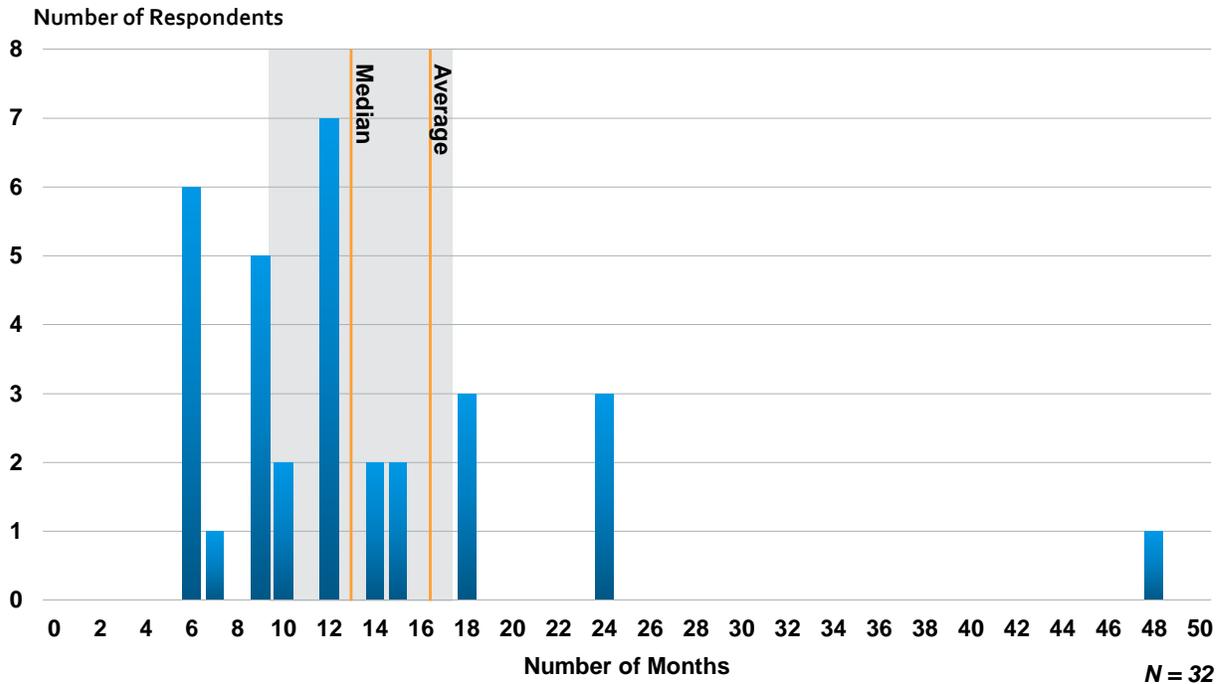


Figure 3-5. Average and median length of time (in months) to complete the full, initial TSMO planning process.

TSMO Goals and Objectives

The survey asked respondents what they considered to be their agencies’ primary goals or motivations for developing TSMO program plans. In recognition that some agencies may have multiple goals, the question asked respondents to select all that applied out of seven fundamental benefits of TSMO program planning. These options have been listed below, ordered by their frequency of selection (values in parentheses indicate the number of times each option was selected).

1. To better integrate with other agency activities (31);
2. To take advantage of opportunities to advance the agency (21);
3. To ensure that the agency is prepared to take advantage of emerging technologies (21);
4. To secure dedicated funding for TSMO activities and growth (20);
5. To streamline agency project planning and programming (18);
6. To more cost effectively address congestion (17); and
7. To streamline existing TSMO activities that were being executed inefficiently (16).

Responses were relatively evenly divided among these goals, with the exception of the most commonly selected goal: “to better integrate with other agency activities.” Thirty-one out of the 35 respondents who completed this question (89 percent) selected this goal – representing a large majority. It is evident that this goal has been a relatively ubiquitous driving factor behind decisions to develop a TSMO program plan.

Better integration of TSMO with other agencies activities is a key motivation behind TSMO program planning.

The survey also revealed, however, that agencies are at varying stages of actually integrating TSMO goals into their larger agencywide goals and mission. Fourteen out of 36 respondents (39 percent) in the “Yes Group” said that their agency’s overall mission/vision statement only vaguely references TSMO goals and activities; for example, with references to operations or safety goals. Only four out of 36 (11 percent)

indicated that their agency’s overall mission specifically incorporated TSMO goals. The remainder indicated that their agency’s overall mission did not incorporate TSMO goals.

Nonetheless, agencies appear to be making good progress setting TSMO goals. Twelve out of 36 (33 percent) respondents said that their agency has a clear set of TSMO goals, objectives, and performance measures (outside of their agency’s larger goals and mission). An additional 18 respondents (50 percent) said that their agency currently is working to establish this. Only 6 out of 36 (17 percent) said that their agency does not have a clear set of TSMO goals.

Leaders and Champions

Responses showed that most TSMO planning processes are, for the most part, either led by the agency’s operations division (16 out of 36 responses, or 44 percent) or jointly led by operations and planning divisions (12 out of 36, or 33 percent). TSMO planning efforts, however, also appear to be largely driven by internal champions. Out of the 36 respondents in the “Yes Group,” 23 (64 percent) said that, in their opinion, their agency’s TSMO efforts were driven by a champion or group of champion – with 11 of these responses indicating a senior level or executive champion, 5 indicating a midlevel champion, and 7 indicating a group of champions (Figure 3-6).

TSMO champions within the agency are integral to advancing TSMO program planning.

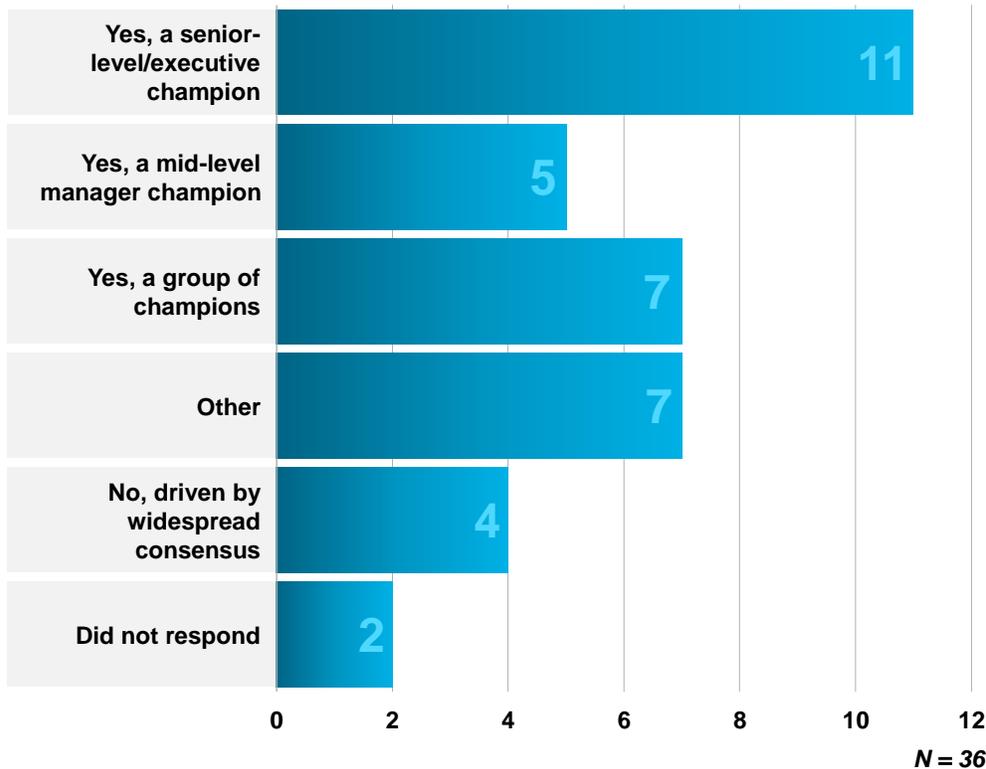


Figure 3-6. Portion of respondents who consider their agency’s TSMO activities to be champion driven.

Regardless of who is leading the process, agencies also appear to be making good progress in terms of defining TSMO leadership and responsibilities. Twelve out of 36 respondents (33 percent) said that TSMO leadership and responsibilities in their agency are well defined, with an additional 13 (36 percent) saying that their agency currently is working to establish well-defined leadership and responsibilities. Further, 21 out of 36 respondents (58 percent) indicated that their agency had at least one staff member with 50 percent or more of the responsibilities in their job description dedicated to TSMO – suggesting progress towards the institutionalization of TSMO activities in transportation agencies. This question, however, proved to be relatively subjective as the comments revealed that respondents interpreted this question differently – with some considering TSMO responsibilities to be those directly tied to an established TSMO program and others considering TSMO responsibilities to be those that fall under the umbrella of TSMO activities (e.g., any responsibilities related to traffic incident management or work zones).

Approach to TSMO Program Planning

Most agencies are working to integrating TSMO program planning into their agencies’ long-term planning process, with 12 out of 36 (33 percent) indicating that this was their agency’s primary approach, and an additional 14 (39 percent) indicating that their agency was simultaneously integrating TSMO into the long-range planning process and developing a separate process of TSMO planning (Figure 3-7). Only 2 respondents said their agency’s primary approach was to develop a separate process for TSMO planning. The remaining respondents selected other or did not respond. While these results indicate that, at a high-level, most DOTs are working to integrate TSMO program planning into long-range planning, further research would be helpful to understand exactly how TSMO is integrated as well as the degree of integration.

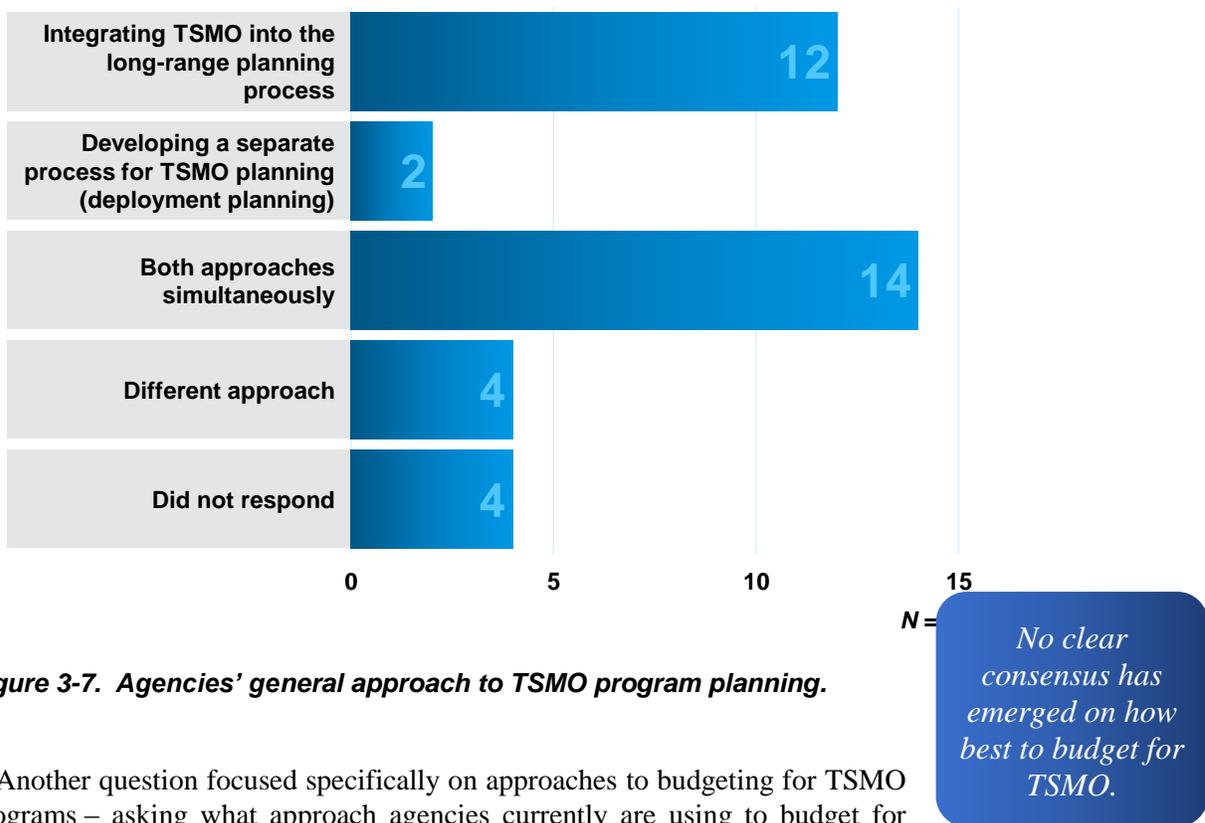


Figure 3-7. Agencies’ general approach to TSMO program planning.

Another question focused specifically on approaches to budgeting for TSMO programs – asking what approach agencies currently are using to budget for

TSMO. This is a fundamental issue that many agencies are exploring as they advance TSMO programs. The survey results, however, suggest that a common approach to budgeting for TSMO has not yet emerged from these initial TSMO program planning efforts. Eleven out of 36 respondents (31 percent) selected “Other” in response to this question; nine (25 percent) said their agency currently packages TSMO projects with related projects in order to compete in a project-focused budget process; 6 (17 percent) said their agency makes informal arrangements to pull TSMO funding from multiple budget line items, and another 6 did not respond (Figure 3-8). Only 4 out of 36 respondents (11 percent) indicated that their agency has a TSMO line item or other dedicated TSMO category in the budget.

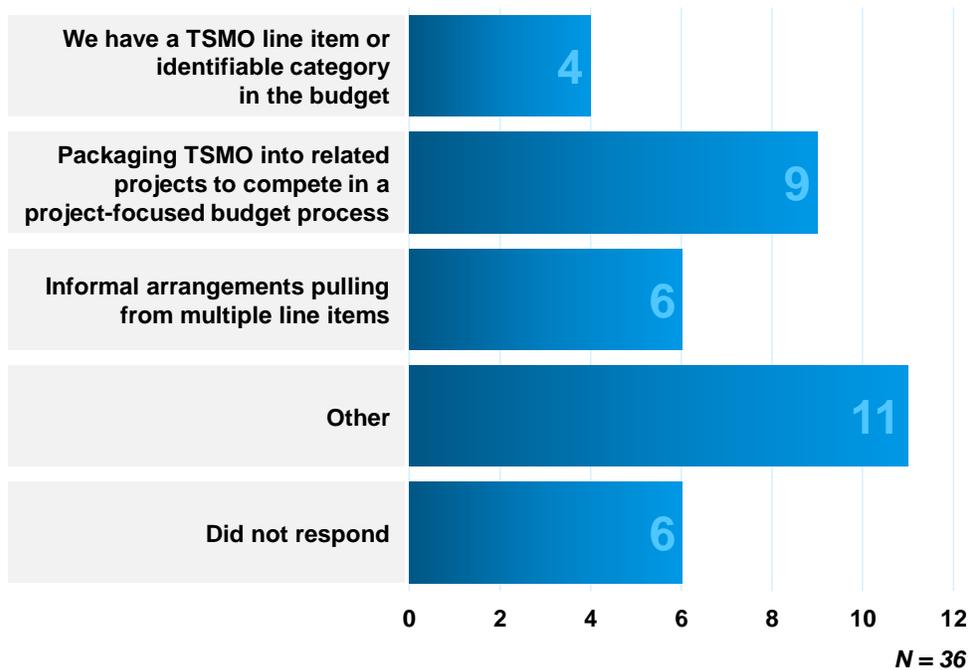


Figure 3-8. Agencies’ current approach to budgeting for TSMO activities.

To explore how agencies have been using both the TSMO program planning framework from NCHRP 20-07 (345) and the CMM workshops, the survey asked respondents how, from their perspective, their agency has been following these frameworks (Figure 3-9). Seven out of 36 (19 percent) said their agency was mostly following the NCHRP 20-07 (345) framework, 12 out of 36 (33 percent) said their agency formed their own approach that aligned more closely with the six CMM dimensions, and 13 out of 36 (36 percent) selected “Other.” The majority of respondents who selected “Other,” however, wrote that their agency simply had not yet determined how it would use the two frameworks; with the remainder indicating that their agency used both frameworks to guide its process. Only one respondent indicated that their agency formed a tailored approach that did not pull from existing frameworks.

Agencies have utilized the existing frameworks, but often adapt them to their own TSMO needs.

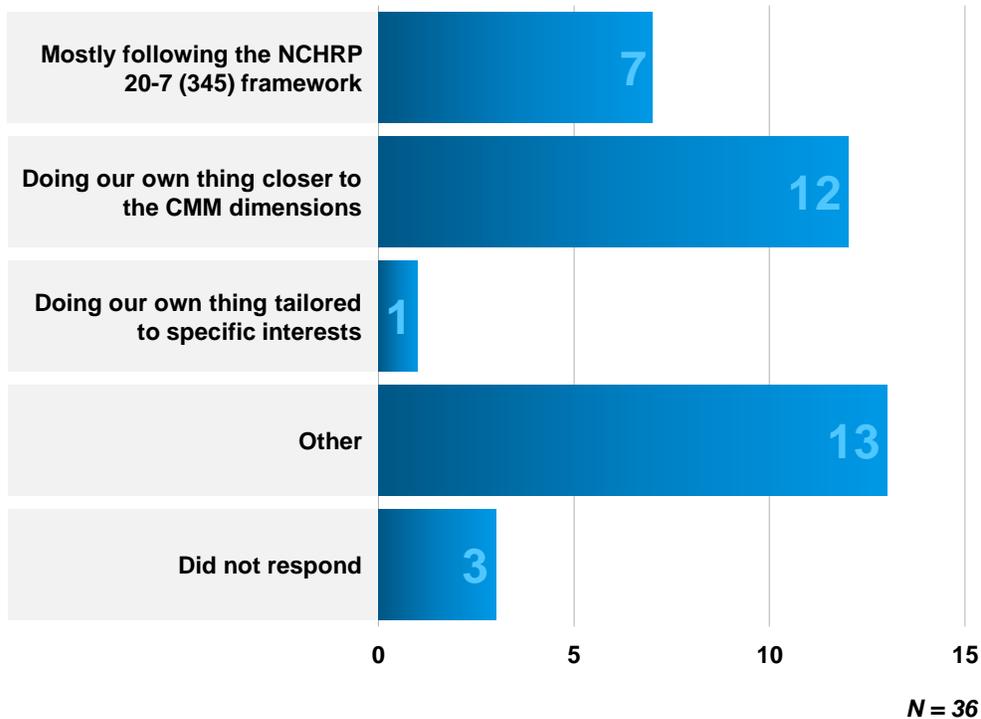


Figure 3-9. Agencies’ utilization of existing TSMO program planning frameworks – the NCHRP 20-07 (345) framework and the CMM dimensions.

Elements of a TSMO Plan

A key question in the survey provided respondents with a range of possible elements in a TSMO program plan (a total of 20 common elements were provided, in addition to the option to select “Other” and fill-in a custom element). Respondents were asked to indicate their agency’s perspective on each element in terms of 1) whether the agency included the element in their TSMO program planning and 2) the importance of that element to the agency’s TSMO program plan (The exact answer options for ranking each element were: did not include; included but view as not very important; included and view as somewhat important; and included and view as very important). Eight people did not give a response for any element and, therefore, the sample size for this “Yes Group” question was considered to be 28 and not 36. Of the 28, some did not give a response for certain components; this is reflected in the analysis in order to maintain a sample size of 28 for all elements.

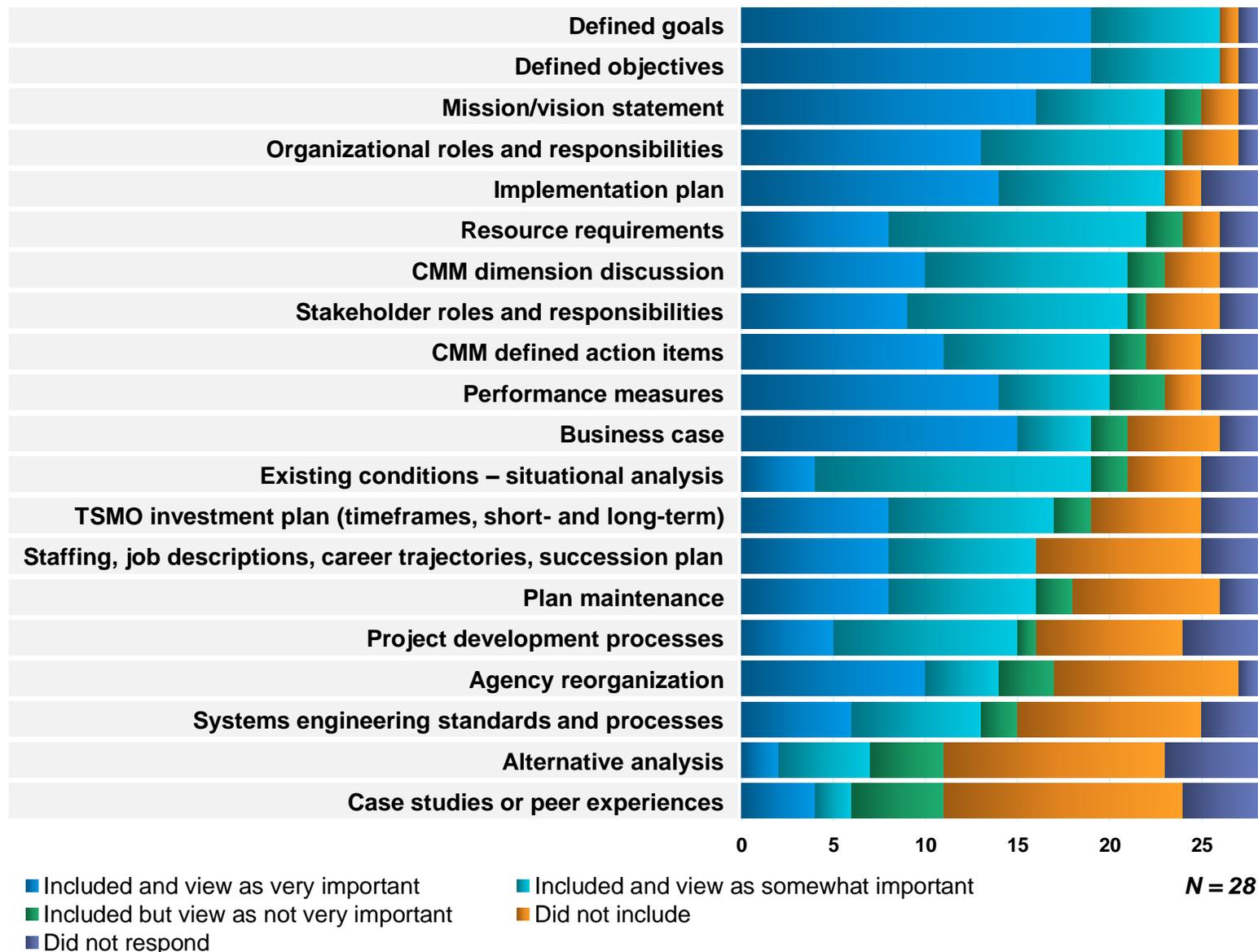


Figure 3-10: Common TSMO program plan elements ranked by inclusion in and importance to the TSMO program plan.

Figure 3-10 illustrates how respondents ranked each element in terms of inclusion and importance, with the elements shown in descending order of importance. “Defined goals” and “defined objectives” were considered the most important, with 26 respondents selecting “included and view as very important” or “included and view as somewhat important” for each. “Mission/vision statement,” “organizational roles and responsibilities,” and “implementation plan” rounded out the top five elements, with 23 respondents selecting included and view as very or somewhat important for each. Notably, “business case” received the fourth highest number of “included and view as very important” responses (15 responses), although it ranked only 11th when these responses were combined with “included and view as somewhat important” (19 responses) for a more cumulative measure of importance. These results, discussed below, highlight the key role of the business case in TSMO program planning.

Respondents considered the most important elements of a TSMO program plan to be:

1. *Defined goals.*
2. *Defined objectives.*
3. *Mission/vision statement*
4. *Organizational roles and responsibilities.*
5. *Implementation Plan.*

Further, these responses align well with both the NCHRP 20-07 (345) and the CMM framework – validating the essential aspects of both. The elements “defined goals,” “defined objectives,” and “mission/vision statement” are represented in first component of the NCHRP 20-07 (345) framework: “Mission, Vision, Goals, Objectives, and Performance Measures.” The element, “organizational roles and responsibilities,” is represented in the CMM “Organization and Workforce” dimension as well as the NCHRP 20-07 (345) “Resources” and “Leadership and Organization” components. The element “implementation plan,” on the other hand, is touched upon by both frameworks although not given particular emphasis. The survey results’ emphasis on implementation plans represents an opportunity to highlight the importance of implementation plans in this project’s Unified TSMO Program Planning Framework.

Making the Business Case for TSMO

Making the business case for TSMO has emerged as an important need and tool as agencies develop and implement TSMO program plans. Business cases can be tailored to specific audiences as an effective method to engage, educate, and gain support from various partners, stakeholders, and legislators. As an element within a larger TSMO program plan (Figure 3-10, above), respondents attributed a fair amount of importance to business cases. Nineteen respondents (68 percent) indicated that their agency included a business case and views it as a very or somewhat important element – making a business case the 11th most important element by this ranking. Based solely on the number of respondents selecting included and view as very important (15 respondents or 54 percent), however, business case would be the fourth most important element – highlighting its key role in TSMO program planning.

Agencies believe making the business case for TSMO is important, but most have not developed standalone materials yet.

On the other hand, when respondents were asked if their agency developed a business case separate from the TSMO program plan, 26 out of 36 (72 percent) said they had not (Figure 3-11). Only five respondents said their agency developed a business case separate from its TSMO program plan. The remainder did not respond to this question. These responses suggest that while agencies recognize the importance of the business case, they generally are not yet developing and using business case materials outside of the larger TSMO program plan.

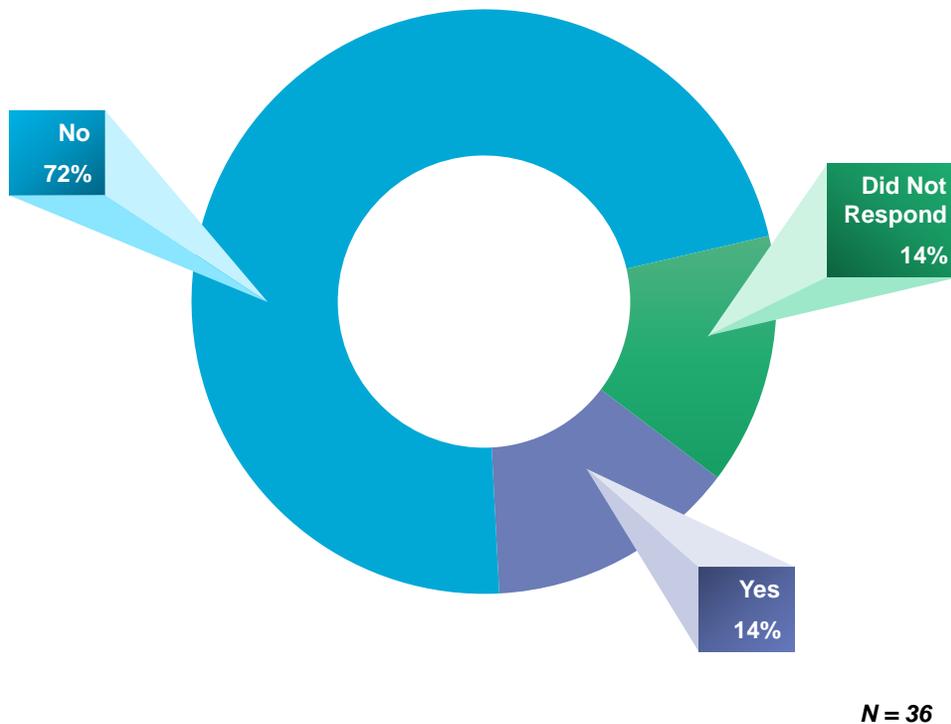


Figure 3-11. Portion of respondents from agencies that have developed a business case separate from the TSMO program plan.

The survey also asked respondents which arguments they have found most effective in making the business case for TSMO. Respondents were able to select all answers that applied and no single argument emerged as the most effective, indicating that agencies are finding the following three argument to be more or less equally effective and are likely using them in tandem with one another (number of responses for each argument, out of the 32 total respondents who replied to this question, is noted in parentheses):

1. TSMO projects typically cost much less than capital projects and have higher benefit-cost ratios (23);
2. TSMO strategies are well suited to address nonrecurring congestion, which accounts for the majority of congestion in most urban areas (19); and
3. TSMO strategies are implemented quickly, so benefits are realized in the short term (21).

SHRP 2, CMM Workshops, and Other Resources

The majority of respondents in the “Yes Group” had both received SHRP 2 funding for TSMO program planning (21 out of 36, or 58 percent) and participated in a CMM workshop (29 out of 36, or 81 percent). An additional 9 respondents (25 percent) working at agencies that did not receive SHRP 2 funding indicated that the agency either received technical assistance from the Federal Highway Administration (FHWA) or funding from another source.

Respondents who indicated that their agency had hosted or participated in a CMM workshop were asked a series of follow-up questions regarding the agency’s progress on each of the six CMM dimensions: business processes; systems and technology; performance measurement; agency culture; organization and staffing; and collaboration. When asked which CMM dimension their agency had

focused on the most in its TSMO program planning (with the ability to select all that apply), the 27 respondents who answered this question revealed the following order of emphasis:

1. Business processes (21 respondents or 78 percent);
2. Performance measurement (18 respondents or 67 percent);
3. Collaboration (17 respondents or 63 percent);
4. (Tie) Agency culture (15 respondents or 56 percent);
5. (Tie) Organization and staffing (15 respondents or 56 percent); and
6. Systems and technology (11 respondents or 41 percent).
7. Responses across the two questions revealed some good consistency in terms of agencies' progress on each of the CMM dimensions. For example, systems and technology was ranked as neither a focus nor a challenge, suggesting that agencies are well prepared in terms of their TSMO systems and technology. On the other hand, the responses also revealed some disparities. Agency and culture as well as organization and staffing were identified as the two most challenging CMM dimensions, but only approximately half of agencies appear to be focusing on these areas.

FHWA resources (CMM workshops and NOCoE) and agency operations resources have been key to TSMO program plan development.

In terms of more general resources for TSMO program planning, the survey asked what the key resources have been for agencies in developing these plans (select all that apply). Respondents indicated that FHWA resources (including CMM workshops and the National Operations Center of Excellence (NOCoE)), as well as existing resources within the agency operations divisions, had been the most significant resources used to develop TSMO program planning. Out of the 30 respondents who answered this question, 22 respondents (73 percent) selected FHWA resources and 20 (67 percent) selected operations division resources (Figure 3-12). Existing resources from transportation management centers (TMC) and agency planning divisions also were considered key resources, with 17 out of 30 respondents (57 percent) selecting both of these sources. Additionally, in a separate question, the majority of respondents (19 out of 31 respondents, or 61 percent) indicated that their agency used a consultant to help generate the TSMO program plan; while 12 out of 31 respondents (39 percent) said that their agency developed its TSMO program plan in-house.

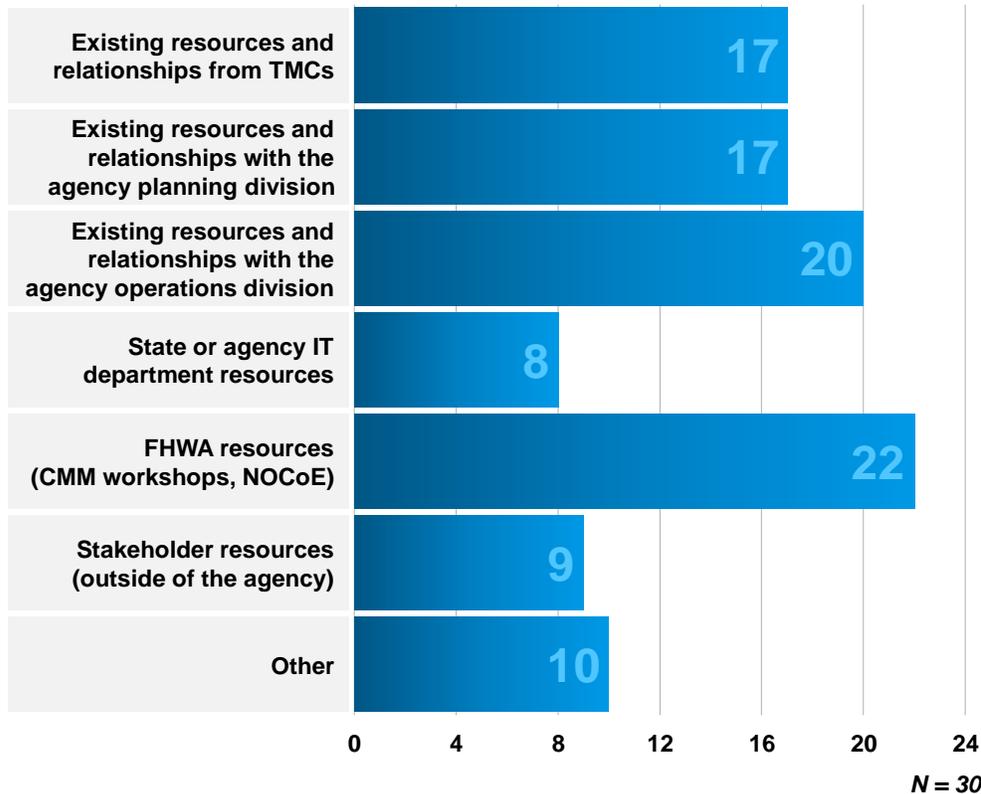


Figure 3-12. Key resources used by agencies in developing TSMO program plans.

When asked if there are any resources that agencies have not had that would be particularly beneficial to developing TSMO program plans, 20 out of 31 respondents (65 percent) answering this question indicated that best practices from existing, successful TSMO program plans would be beneficial. And additional 10 out of 31 respondents (32 percent) indicated that each of following would be beneficial: additional information on TSMO strategies; TSMO-specific outreach techniques; and assistance in developing business cases or working with legislature.

Finally, the survey asked if there are any specific areas of TSMO on which agencies would like to see peer success stories, best practices, or lessons learned. Respondents provided a wide range of suggestions, including the following areas of TSMO:

- Agencies that have restructured their main business processes to incorporate TSMO and, in particular, agencies that have integrated TSMO into the DOT capital programming process;
- Funding, especially creative funding strategies;
- Agencies that have addressed career development and advancement gaps, including best practices in staffing, workforce organization, and workforce development;
- Approaches to justifying additional staffing and resources to executive management;
- Agencies that have developed TSMO knowledge transfer tools, such as webpages and training;
- Developing a TSMO program plan and phased implementation at the MPO level, as well as TSMO program plan implementation in general;
- The benefits of TSMO versus the costs of implementation;
- TSMO performance measures; and
- Perspectives and information on concrete TSMO changes versus the rebranding of traffic operations.

Stakeholders, Partners, and Policy-Makers

The survey showed that agencies have been only moderately engaging stakeholders and other partners in the development of TSMO program plans. Based on 29 responses, slightly less than half of respondents (14 respondents, or 48 percent) said their agency had engaged stakeholders and other partners in generating its TSMO program plan – while 15 respondents (52 percent) said their agency had not. Likewise, a similar question regarding the engagement of regional agencies also revealed only moderate engagement. Out of 30 responses to this question, only 12 respondents (40 percent) said their agency had engaged other regional agencies in generating its TSMO program plan, although an additional 11 respondents (37 percent) indicated that their agency had maintained normal levels of engagement and coordination with regional agencies throughout the process. Seven respondents (23 percent) indicated no engagement with regional agencies.

Policy-makers have been fairly supportive of advancing and institutionalizing TSMO

Encouragingly, the survey revealed a fair amount of support from policy-makers for advancing TSMO, at least for respondents at agencies that were developing or implementing TSMO program plans. Respondents were asked: have policy-makers been supportive of advancing and institutionalizing TSMO? Twenty out of 31 respondents for this question (65 percent) indicated that policy-makers have been supportive of TSMO initiatives. Four respondents (13 percent) indicated that policy-makers have been neutral or do not understand the benefits of TSMO. Only one respondent said that winning support for TSMO from policy-makers has been a challenge.

Challenges

A final question to the “Yes Group” was: where had your agency encountered problems in the development of its TSMO program plan? Of the 27 respondents who answered this question, 14 (52 percent) indicated that simply crafting the TSMO program plan had been a key challenge. Ten respondents (37 percent) said that securing the authority to make changes in agency culture had been a challenge, and an additional eight (30 percent) said that securing the authority to make changes in general due to agency funding/resource constraint has been a challenge.

The “No Group”

Survey respondents in the “No Group” indicated that their agency was not currently working towards the creation of a TSMO program plan. These respondents received a tailored set of questions for agencies that were not working on TSMO program plans, the results of which are discussed below. There was a total of 12 respondents in the No Group.

Obstacles to TSMO Program Planning

The questions for the “No Group” sought to gauge what, if any, obstacles, may be keeping agencies from developing TSMO program plans. One question asked: for what reasons is your agency not currently working towards a TSMO program plan (select all that apply)? Six out of 12 respondents (50 percent) said that their agency currently is more focused on maintaining existing initiatives with limited resources and funding (Figure 3-13). Other reoccurring answers included: the agency is holding off until

Agencies not currently working on TSMO program plans are instead focused on maintaining existing initiatives

it can first address other more pressing operations issues (4 respondents, 33 percent); the agency does not have any particular champions of TSMO or does not have any champions in the position to advance a new initiative (4 respondents, 33 percent); and the benefits of TSMO program planning for the agency, state, or region currently are not evident (3 respondents, 25 percent).

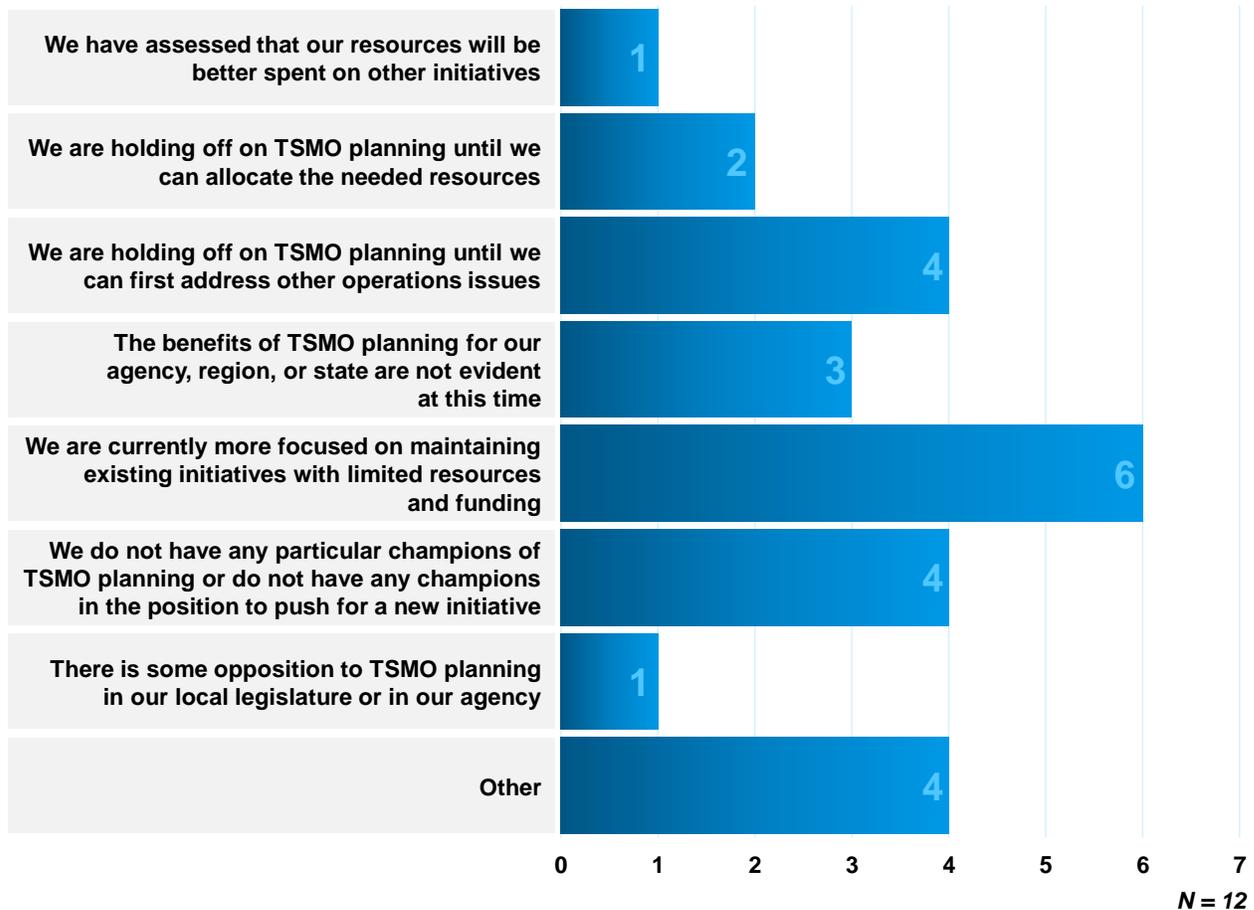


Figure 3-13. Reasons preventing agencies from working towards a TSMO program plan.

As a follow-up question, the survey asked what might prompt agencies in the “No Group” to pursue TSMO program planning sooner. Of the nine people responding to this question, answers were more or less evenly split across the four provided answers: demonstrations of the benefits of TSMO program planning in other state and regions (6 respondents, 67 percent); opportunities to obtain funding and other resources for TSMO program planning (6 respondents, 67 percent); opportunities for staff to learn more about TSMO program planning (6 respondents, 67 percent); and specific or updated best practices for creating TSMO program plans (5 respondents, 56 percent).

As with the “Yes Group,” the survey also asked the “No Group” if they found that policy-makers in their state/region were generally supportive of advancing and institutionalizing TSMO. Only two out of 12 respondents (17 percent) said that policy-makers were supportive of TSMO (Figure 3-14), in comparison to 65 percent in the Yes Group. Five (42 percent) said that policy-makers were neutral or did not understand the benefits of TSMO, and another two (17 percent) said that winning support from policy-makers had been a challenge. Three respondents selected “Other” and noted varying levels of support from policy-makers at different levels of government. The results suggest that agencies not currently developing TSMO program plans have generally encountered more resistance from policy-

makers – indicating that outreach and business cases directed at policy-makers may be useful in launching new TSMO program planning initiatives.

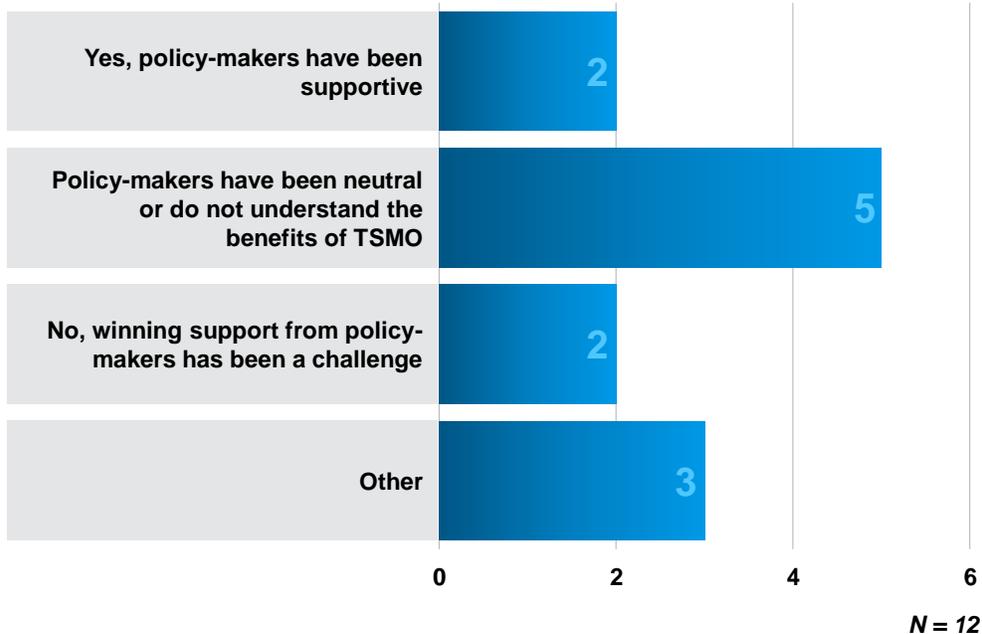


Figure 3-14. Level of support from policy-makers for respondents/agencies in the No Group.

Current TSMO Activities and Awareness

As with the “Yes Group,” the survey asked the “No Group” if the mission/vision statement of their agency specifically includes TSMO goals. The majority of respondents – eight out of 12 (67 percent) – said that it does not (Figure 2-13). Four (33 percent) said that their agency’s mission/vision statement indirectly or vaguely references TSMO goals, through the use of language such as operations, incident management, etc. No respondents in the “No Group” said that their agency’s mission/vision statement specifically references TSMO goals or that their agency has a separate TSMO mission/vision statement. These results contrast somewhat with the “Yes Group” response to this question, but not dramatically. In the “Yes Group,” just 11 percent indicated that their agency’s overall mission specifically incorporated TSMO goals, while 39 percent said that the overall mission statement only vaguely references TSMO goals and activities. The remainder of the “Yes Group” (50 percent) indicated no specific mention of TSMO goals in their agency’s overall mission/vision statement.

When asked if TSMO responsibilities and leadership were well defined at their agency, only one respondent in the “No Group” indicated that they were. However, nine out of 12 (75 percent) said that their agency currently was working to establish better-defined TSMO responsibilities and leadership. Only 2 respondents said no, with the indication that no work was being done in this area.

To gauge perspectives and awareness of TSMO program planning in “No Group” agencies, the survey asked: how would you describe your agency’s level of attention to the emerging practice of TSMO program planning? Five out of 12 (42 percent) indicated that a few individuals were tracking national trends and discussing the concept of TSMO program planning. However, 4 respondents (33 percent) said that the concept of TSMO program planning was generally not on the agency’s radar. The remainder indicated that operations managers and staff were generally well aware of trends in TSMO program planning.

CMM Workshops

Half (6 out of 12 respondents, 50 percent) of respondents in the “No Group” said their agency had hosted or participated in a CMM workshop, while the other half said their agency had not. When asked if they would like someone to provide them with further information on CMM workshops, three of the six respondents from agencies that had not had a CMM workshop indicated interest in more information. An additional two “No Group” respondents from agencies that already had participated also expressed interest in more information. While this a small sample size, these results indicate that there is still demand for CMM workshops to help launch TSMO program planning efforts.

Key Findings from the Survey

General Insights

The following is a summary of general findings from the survey with respect to TSMO program planning activities, practices, and lessons learned.

- The majority of survey respondents worked at agencies that had participated in a CMM workshop. This indicates that the survey results also are a useful tool for evaluating agency progress following a CMM workshop – particularly, best practices and lessons learned since the workshop.
- There has been a steady increase in agencies initiating TSMO program planning activity since January 2014.
- Agencies are conducting TSMO program planning for a diversity of reasons, and typically have several driving goals behind their TSMO program plan. The goal of better integrating TSMO activities with other agency activities, however, stood out as a major motivation behind TSMO program planning efforts.
- The survey confirmed much of the knowledge that TSMO professional have accumulated through individual TSMO program planning efforts and the CMM workshops, such as:
 - Agencies currently are at varying stages of actually integrating TSMO goals into their larger goals and mission. However, agencies appear to be working and making good progress towards setting clear TSMO-specific goals, objectives, performance measures, leadership, and responsibilities.
 - TSMO program planning efforts continue to be generally champion-driven, whether that means a senior-level champion, a midlevel champion, or a group of champions.
 - The majority of agencies are approaching the TSMO program planning by working to integrate the process into their larger long-term planning process.
 - No common approach has emerged in regard to how agencies budget for TSMO activities.
 - Agencies have been utilizing aspects of existing TSMO program planning frameworks and models (i.e., the NCHRP 20-07 (345) framework and the CMM workshops), but continue adapting and customizing such framework for their unique needs. The most popular answer to the survey question regarding use of existing frameworks was “Other.” This confirms the need to update and validate existing frameworks in light of the field’s evolution and lessons learned.
- With regard to the elements of a TSMO program plan, agencies consider elements that clearly define the goals and execution of the plan to be the most important. These elements, in order of attributed importance, include: defined goals, defined objectives, mission/vision statement, organizational roles and responsibilities, and implementation plan. Survey respondents also attributed a relatively high degree of importance to the elements “business case” and “performance measures.”

- While survey respondents attributed a relatively high degree of importance to the business case element of a TSMO program plan, agencies largely are not developing business case material for use outside of TSMO program plans. This presents an opportunity for agencies to strengthen outreach to stakeholders, partners, and legislators through the development of TSMO business cases tailored to specific audiences.
- Respondents in the “Yes Group” who worked at an agency that had participated in a CMM workshop indicated that, of the six CMM dimensions, agencies have focused the most on integrating TSMO into agency business practices and have been challenged the most by adapting agency culture to support TSMO program planning. The focus on business practices is in keeping with the common agency goal of better integrating TSMO into larger long-term planning processes.
- FHWA resources (including CMM workshops and the National Operations Center of Excellence (NOCOe)) and existing resources within agency operations divisions have been the most significant resources used by agencies to develop TSMO program plans.
- Agencies that are not currently working towards a TSMO program plan (the “No Group”) indicated a variety reasons for this. The reason, “We are currently more focused on maintaining existing initiatives with limited funding,” was the most popular response.
- Respondents in the “No Group” did not converge around any one thing that would prompt their agency to pursue TSMO program planning sooner. However, a separate question revealed that perceived support for TSMO from legislators was lower in the “No Group.”

Specific Insights for Inclusion in the Unified TSMO Program Planning Framework

The following is a summary of specific findings from the survey that are directly relevant or applicable to the structure or content of the Unified TSMO Program Planning Framework, documented and discussed fully in Chapter 5 of this report.

- **Motivation:** Among agencies that are not currently working towards TSMO program plans, the following were mentioned as possible motivators that could encourage them to do so:
 - Demonstrations of the benefits of TSMO program planning in other state and regions.
 - Opportunities to obtain funding and other resources for TSMO program planning.
 - Opportunities for staff to learn more about TSMO program planning.
 - Specific or updated best practices for creating TSMO program plans.
- **Resources:** The following were cited as resources that would help most with the development of TSMO Program Plans:
 - Example Plans: Approximately two thirds of respondents that are working on TSMO Program Plans indicated that best practices from existing, successful TSMO Program Plans would be beneficial.
 - Other helpful resources requested include:
 - Additional information on TSMO strategies.
 - TSMO-specific outreach strategies.
 - Guidance for developing business case materials or working with legislators. This also was cited as a leading need among respondents whose agencies were not actively pursuing TSMO program plans.
- **Timing:** Respondents indicated that developing the TSMO Program Plan itself requires a commitment of 1-2 years to complete.
- **Leadership:** Most respondents indicated that the agency’s operations division, sometimes in concert with the planning division, generally leads the TSMO Program Plan effort. Most respondents also indicated that a TSMO champion was available at each of their agencies.

- Securing the authority to make changes was cited by more than half of all respondents who are engaged in the development of TSMO Program Plans as a common challenge, due to either department culture or a lack of funding/resources.
- **Integration:** TSMO plans are generally integrated with agencies' long-term planning processes.
- **Framework Guidance:** Both the CMM and NCHRP 20-07 (345) frameworks have been utilized to guide TSMO program plan development, but agencies often tailor them to meet their unique needs. The survey responses can be used to validate which specific aspects of each framework should be carried over to the Unified TSMO Program Planning Framework (see bullet below).
- **Key Program Plan Elements:** The following plan elements were identified as important or very important by a majority of respondents (ordered by decreasing importance). Many of these program plan components overlap substantially with those captured in the NCHRP 20-07 (345) framework and the CMM framework.
 - Goals and objectives
 - *Most common goal:* The most frequently cited goal for a TSMO program plan was: to better integrate with other agency activities. Others included: advancing the agency's capabilities, being prepared for new technologies, and securing TSMO funding.
 - *An early step:* A majority of respondents that currently are working on TSMO program plans responded that they already have clearly defined their TSMO goals, objectives, and performance measures, or are in the process of doing so now. Most respondents who indicated that their agencies were not currently seeking TSMO program plans also indicated that there is no mention of TSMO in their agency vision/mission statements.
 - Mission/vision statement.
 - Organizational roles and responsibilities.
 - Implementation plan.
 - *Learning from Peers:* Respondents indicated that they would be interested in learning how other peer agencies have successfully developed a phased implementation plan at the MPO level, as well as TSMO program plan implementation strategies in general.
 - Resource requirements.
 - Discussion of CMM dimensions.
 - Stakeholder roles and responsibilities.
 - CMM action items.
 - *Common areas for targeted growth:* Respondents cited agency culture as the dimension that carried the most significant challenges with respect to TSMO planning. The Organization and Staffing CMM dimension was another commonly cited challenge.
 - Performance measures.
 - *Learning from Peers:* Respondents indicated that they would be interested in learning how other peer agencies have successfully incorporated TSMO performance measures into their TSMO program plans.
 - Business case for TSMO.
 - *Common Strategies:* The most commonly referenced arguments to establish a business case for TSMO were:
 - TSMO projects typically cost much less than capital projects and have higher benefit-cost ratios.
 - TSMO strategies are well suited to address nonrecurring congestion, which accounts for the majority of congestion in most urban areas.
 - TSMO strategies are implemented quickly, so benefits are realized in the short term.
 - *Learning from Peers:* Respondents indicated that they would be interested in learning how other peer agencies have successfully addressed this topic (e.g., cost/benefit analyses).

- Summary of existing conditions.
- TSMO investment plan.
 - *Learning from Peers*: Respondents indicated that they would be interested in learning how other peer agencies have successfully addressed this topic.
 - *Common Strategies*: No clear leading method was identified for TSMO funding. The following were all identified as common sources of TSMO investment:
- TSMO line-item or identifiable category in the budget.
- TSMO is packaged into related projects to conform to a project-focused budget process.
- TSMO is funded through informal arrangements that draw upon several other budget line items.
- Staffing, job descriptions, career development and succession plans
 - *TSMO in the job descriptions*: A majority of respondents that currently are working on TSMO Program Plans indicated that at least one staff member with 50 percent or more of his/her responsibilities related to TSMO.
 - *Learning from Peers*: Respondents indicated that they would be interested in learning how other peer agencies have successfully addressed this topic, including justifying additional staffing and resources to executive management.
- TSMO plan maintenance.
- Project development processes.
 - *Learning from Peers*: Respondents indicated that they would be interested in learning how other peer agencies have successfully restructured their main business processes to incorporate TSMO, and how they have integrated TSMO into the DOT capital programming process.
- Agency reorganization.
 - *Learning from Peers*: Respondents indicated that they would be interested in learning how other peer agencies have successfully addressed this topic.
- **Learning from Peers**: In addition to the “Learning from Peers” items listed above, respondents indicated that they would be interested in learning how other peer agencies have successfully:
 - Developed TSMO knowledge transfer tools, such as webpages and training; and
 - Distinguished between concrete TSMO advancements and a simple rebranding of traffic operations.

CHAPTER 4

Workshop Objectives and Findings

This chapter presents a summary of the findings from the project’s workshop to validate existing transportation systems management and operations (TSMO) program planning framework based on agency experiences and the national survey results, and apply these insights to create a Unified TSMO Program Planning framework.

Workshop Objectives

In February 2016, the project organized a small, two-day workshop for NCHRP 20-07 Task 365 panel members and TSMO leaders from State Departments of Transportation (DOT) and Metropolitan Planning Organizations (MPO). The overarching goal of the workshop was to collectively evaluate and validate the earlier TSMO program planning frameworks (the NCHRP 20-07 (345) framework and the CMM framework for advancing TSMO program planning). These frameworks were developed while agencies were largely in the nascent stages of TSMO program planning. Now that many agencies have matured in their TSMO program planning – whether they are implementing their plans, developing their plans, or preparing to plan – the workshop provided an important opportunity to collectively vet and refine these frameworks to ensure they reflect best practices from agencies’ real-world experiences.

In pursuit of these objectives, the facilitators of the workshop collected agencies’ experiences, best practices, and perspectives on the existing frameworks from participants through a series of exercises and discussions. The workshop also included a presentation of the results of the national survey on TSMO program planning so that those experiences and perspectives could be integrated into the discussion and, ultimately, the project’s Unified TSMO Program Planning Framework. While the majority of workshop participants and survey respondents brought a statewide perspective on TSMO program planning, both the workshop and survey took measures to ensure that regional perspectives from those representing MPOs or regional planning efforts at State DOTs were fully captured and integrated as well. The sequence of workshop sessions, briefly described below, was designed to encourage participants to share and reflect upon their experiences in TSMO program planning, compare and contrast these experiences with the existing frameworks, and apply their insights to the Unified TSMO Program Planning framework.

Day 1 Workshop Sessions

- **Self Introductions and Updates** – All participants introduced themselves and provided the group with an update on current TSMO program planning efforts, future plans, challenges, etc. at their agencies.
- **Results of the National Survey on TSMO Program Planning** – The project team presented the results of the national survey on TSMO program planning. The presentation was coupled with group discussion to collect feedback, insights, and reactions from participants.
- **Elevator Speech Exercise** – Participants performed a role-play exercise in which one participant assumed the role of a TSMO manager at a State DOT, while a second participant assumed the role of that State’s Secretary of Transportation. The general premise was that the

two participants had happened to cross paths in an elevator, where the TSMO manager seeks to obtain support for advancing TSMO from the Secretary (i.e., making the business case for TSMO). Participants in both roles were given a variety of backgrounds and interests so the workshop could evaluate and discuss the scenario under different circumstances. The three distinct role-play scenarios used in the workshop are described briefly below:

1. A TSMO manager who seeks support for a key aspect of the DOT's forthcoming TSMO program plan runs into the Secretary of Transportation, who is very supportive of the TSMO initiative but needs more firm details on the manager's approach to measuring and managing performance before supporting any big changes.
 2. A TSMO manager who seeks support for a key aspect of the DOT's forthcoming TSMO program plan runs into the Secretary of Transportation, who is primarily focused on achieving the large goal of improving two essential interchanges in the State's largest urban area and is hesitant to start any new initiatives that may delay this project.
 3. A TSMO manager who seeks support for rearranging the DOT to establish a new TSMO division in parallel with the DOT's upcoming TSMO program plan runs into the Secretary of Transportation, who has heard a little about other states establishing TSMO divisions and is curious to know more. The Secretary capitalizes on this opportunity to ask the manager for detailed information on the process and potential benefits of this type of reorganization.
- **Build Your Own" TSMO Program Planning Framework** – Participants formed four small groups in which they applied their firsthand agency experiences and knowledge of existing TSMO practices/methods to assemble custom TSMO program planning frameworks. All groups were supplied with a blank poster-board template (see Figure 4-1) and materials derived from existing frameworks with which they could build updated frameworks. These materials included handouts on the NCHRP 20-07 (345) framework and the CMM framework, as well as a wide range of suggested "steps" and "key objectives and activities" to add to the templates. Three groups were comprised of individuals whose professional focus was statewide TSMO, while one group was comprised of individuals whose professional focus was regional TSMO. When complete, the four groups reconvened and presented their four frameworks. From these presentations, a set of common elements and patterns emerged, which will be used in this report to further inform the Unified TSMO Program Planning Framework.

Day 2 Workshop Sessions

- **Gaining Consensus on the Unified TSMO Program Planning Framework** – Participants built upon the results of the Day 1 "Build Your Own" TSMO Program Planning Framework exercise to develop a validated, consensus-built Unified TSMO Program Planning Framework. To facilitate the process, the research team first presented a summary of findings from Day 1 and proposed a draft framework ("Draft Consensus Framework") that synthesized these findings as a starting point for the Day 2 discussion.
- **Resources for Advancing TSMO** – After gaining consensus on the Unified TSMO Program Planning Framework, the group discussed the resources public agencies need to facilitate TSMO program planning. The discussion focused on sharing information and feedback on currently available resources as well as identifying new resources that would be particularly beneficial.

Workshop Findings

Workshop sessions with findings, discussion points, or recommendations of particular significance to this final report and the development of the Unified TSMO Program Planning Framework are discussed in greater detail in the sections below; these sessions include the Elevator Speech, “Build Your Own” TSMO Program Planning Framework, Gaining Consensus on the Unified TSMO Program Planning Framework, and Resources for Advancing TSMO exercises/discussions. A comprehensive set of detailed meeting minutes for the two-day workshop is included in Appendix C.

Elevator Speech Exercise Results

The objective of this exercise was to identify key elements of an effective TSMO business case and strategies for soliciting support from executive leadership, decision-makers, and other external entities. The following set of strategies and methods were effectively employed during the exercise or recommended in the discussions that followed.

- **Content Strategies:** Emphasizing the benefits of TSMO over more traditional transportation improvement approaches is fundamental to making the business case. Depending on the context, the following benefits are typically highlighted:
 - TSMO strategies are cost-effective in several ways. They are relatively lower cost than traditional approaches and can be effectively built-up and enhanced over time with the funding of additional projects.
 - TSMO investments are more practical and faster to implement than capital improvements. For example, constructing new lanes is expensive, time-consuming, and offers no benefits during uncongested times; whereas TSMO investments are none of these things.
 - TSMO strategies generally align well with existing goals and initiatives (e.g., safety, stimulating the economy) and TSMO program plans enhance many TSMO activities that most states already are conducting (e.g., traffic incident management).
- **Communication Strategies:** Particularly in situations like impromptu elevator conversations, the group identified the following set of effective communication strategies for making the TSMO business case:
 - Keep initial conversations short and to focus simply on sparking interest or curiosity; try to establish a follow-up conversation in which more details can be provided.
 - Center the conversation around tangible examples (e.g., recent news events) with specifics and statistics if possible.
 - Comparing the outcomes associated with TSMO strategies to the outcomes of capital projects is effective; however, it is key to avoid positioning TSMO as a competitor to capital projects. Instead, characterize TSMO as complementary to existing projects and programs. Highlight that TSMO strategies have strengths that complement the weaknesses of other strategies.
 - Avoid using jargon with audiences who likely are not familiar with such language. For unavoidable jargon terms (i.e., TSMO) first briefly explain in simple terms.
 - Be prepared to offer references to materials that provide a concise summary of information pertinent to the business case; avoid offering references to lengthy materials as this places a time burden on the audience (Note: this strategy underscores the importance of developing good outreach materials that make the business case for TSMO).
- **TSMO Program Plan Relevance:** The group discussed the aspects of a business case that would typically be included in a TSMO program plan as well. These aspects included the benefits mentioned above – along with examples and detailed information. Additionally, TSMO program plans generally should highlight how TSMO aligns with current state goals.

“Build Your Own” TSMO Program Planning Framework

When all four groups had completed their frameworks, the full workshop reconvened to present and compare the four frameworks, with the goal of identifying the common elements across all four frameworks and determining which steps, objectives, and activities should be considered essential in the Unified TSMO Program Planning Framework. The four TSMO program planning frameworks created in this exercise are provided below (Figures 4-3 through 4-6). During the presentations of their frameworks, each group provided the following additional information:

Additional Information on the Group 1 Framework (MPO/regional group, Figure 4-3)

- The specific TSMO strategies (detailed in the “Key Objectives and Activities” of the framework) may differ by agency, but the process (the “Steps”) would be more or less the same.
- The process includes a feedback loop for evaluation and adaptation over time.
- It is important to recognize in program planning that not all stakeholder may be supportive.

Additional Information on the Group 2 Framework (statewide group, Figure 4-4)

- The first step (“Leadership – Development of Mission/Vision) includes strategic planning, and is used to justify needs and set priorities.
- The second step (“Culture”) is needed before the proper partner agencies can be identified.
- The steps in the initial cycle end with the “Implementation” step, followed by a new cycle (represented by the “Living Document” step).

Additional Information on the Group 3 Framework (statewide group, Figure 4-5)

- The first step (“Set Up Process and Steering Committee”) involves identifying relevant people/agencies and setting expectations/scope; the second step (“Communication and Education”) involves outreach (e.g., public leadership); and the third step involves defining the foundational parts of the plan (“Mission, Visions, Goals, and Objectives”).

Additional Information on the Group 4 Framework (statewide group, Figure 4-6)

- A literature review could be considered as a prerequisite step.
- “Performance Metrics” warranted its own step, while this group did not consider “Culture” to warrant its own step as it would be established in other steps.

Participants agreed that the Unified TSMO Program Planning Framework should be approachable and applicable to a broad range of agencies in terms of geographic scope as well as TSMO program maturity and size. It is expected that some framework components may not be relevant to some agencies, depending on their specific context and TSMO program maturity. As the Unified TSMO Program Planning Framework continues to be refined and enhanced over time, based on additional data gathered from agencies and practitioners around the country, it would be valuable to provide guidance regarding which elements of the framework are generally applicable to agencies at various levels of capability.

- The group also indicated the need to demonstrate linkages and relationships between elements of the framework and components of the TSMO program plan document itself. This concept was further-developed in Day 2 and is included in the discussion of the Unified TSMO Program Planning Framework in Chapter 5.

TSMO Program Plan Framework

National NCHRP Workshop, February 25–26, 2016

Steps <small>to develop and implement the TSMO plan</small>							
Key Objectives and Activities <small>Use provided building blocks or enter your own</small>	•	•	•	•	•	•	•
Involved Parties <small>Check off listed collaborators or enter your own</small>	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/>	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/>	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/>	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/>	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/>	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/>	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/> <input style="width: 100%; height: 15px;" type="text"/>
Notes <small>Additional details or explanation of task activities, outcomes, and results</small>							

Figure 4-1. Blank template for “Build Your Own” TSMO Program Planning Framework exercise.

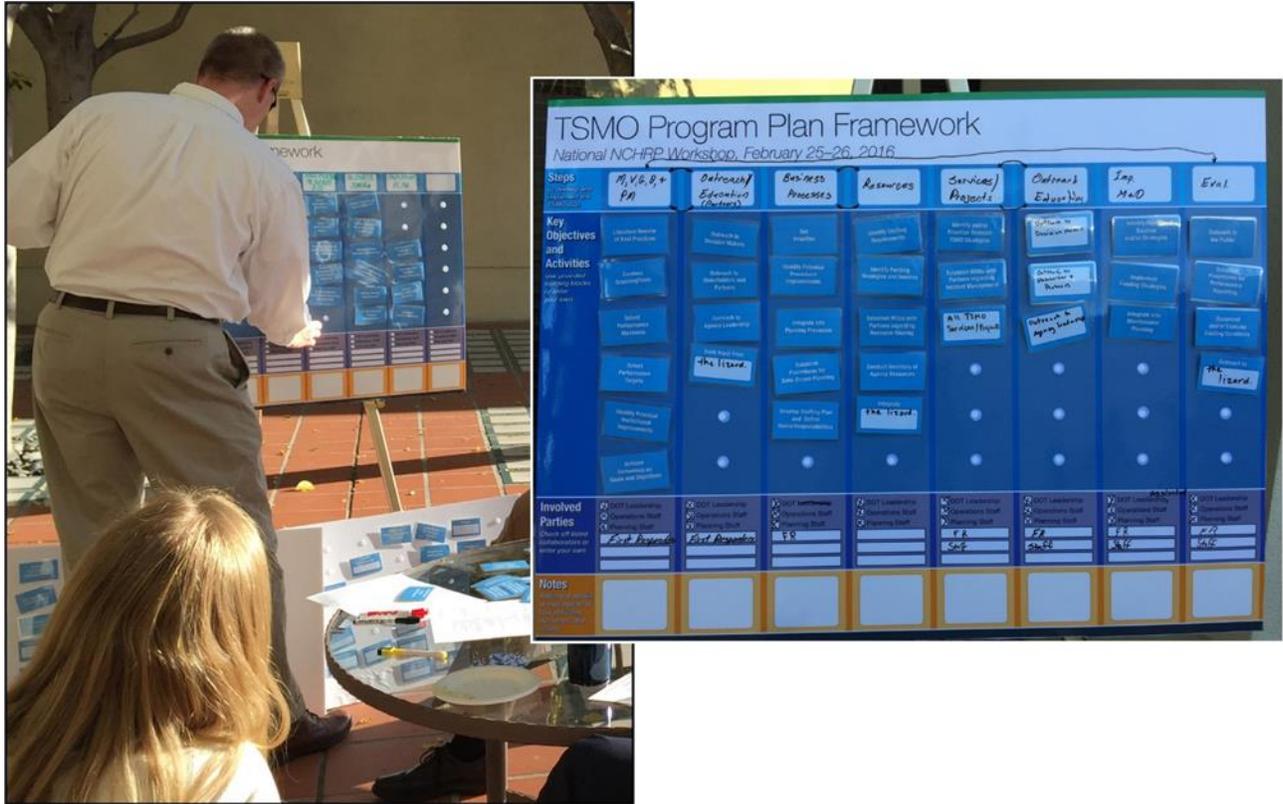


Figure 4-2. Workshop participants engaged in a collaborative group activity to achieve TSMO program plan consensus.

TSMO Program Plan Framework

National NCHRP Workshop, February 25–26, 2016

Steps <i>to develop and implement the TSMO plan</i>	Motivation, Vision, Goals, Objectives and Project Management	Outreach/Education (Partners)	Business Processes	Resources	Services/Projects	Outreach Education	Implementation, Maintenance, and Operation	Evaluation
Key Objectives and Activities <i>Use provided building blocks or enter your own</i>	Literature Review of Best Practices	Outreach to Decision Makers	Set Priorities	Identify Staffing Requirements	Identify and/or Prioritize Relevant TSMO Strategies	Outreach to Decision Makers	Identify Funding Sources and/or Strategies	Outreach to the Public
	Conduct Scanning Tours	Outreach to Stakeholders and Partners	Identify Potential Procedural Improvements	Identify Funding Strategies and Sources	Establish MOUs with Partners Regarding Incident Management	Outreach to Stakeholders and Partners	Implement Funding Strategies	Establish Procedures for Performance Reporting
	Select Performance Measures	Outreach to Agency Leadership	Integrate into Planning Processes	Establish MOUs with Partners regarding Resource-Sharing	All TSMO Services/Projects	Outreach to Agency Leadership	Integrate into Maintenance Planning	Document and/or Evaluate Existing Conditions
	Select Performance Targets	Seek Input from Non-Supportive Stakeholders	Establish Procedures for Data-Driven Planning	Conduct Inventory of Agency Resources	•	•	•	Outreach to Non-Supportive Stakeholders
	Identify Potential Institutional Improvements	•	Develop Staffing Plan and Define Roles/Responsibilities	Integrate Non-Supportive Stakeholders	•	•	•	•
	Achieve Consensus on Goals and Objectives	•	•	•	•	•	•	•
Involved Parties <i>Check off listed collaborators or enter your own</i>	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff First Responders <input type="text"/> <input type="text"/>	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff First Responders <input type="text"/> <input type="text"/>	<input type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff First Responders Dept. of Transportation <input type="text"/> <input type="text"/>	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff <input type="text"/> <input type="text"/>	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff First Responders Staff <input type="text"/> <input type="text"/>	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff First Responders Staff <input type="text"/> <input type="text"/>	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff First Responders Staff <input type="text"/> <input type="text"/>	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff First Responders Staff <input type="text"/> <input type="text"/>
	Notes <i>Additional details or explanation of task activities, outcomes, and results</i>						Involve DOT Leadership as needed	

Figure 4-3. Group 1 framework from the “Build Your Own” TSMO Program Planning Framework exercise (MPO/regional group).

TSMO Program Plan Framework

National NCHRP Workshop, February 25–26, 2016

Steps <i>to develop and implement the TSMO plan</i>	Leadership— Development of Mission/Vision	Culture	Partnerships/ Collaboration	Performance/ Data Analysis	Outreach— Internal and External	Resources	Implementation	Living Document
Key Objectives and Activities <i>Use provided building blocks or enter your own</i>	Outreach to Agency Leadership Set Goals for TSMO and Align with Organization's Strategic Plan Literature Review of Best Practices Develop or Adjust Business Processes to Justify Needs Integrate into Planning Processes Set Priorities	Document Current Agency Practices and Methods Identify Potential Cultural Improvements Identify Potential Institutional Improvements Develop and/or Implement Training Programs Conduct Scanning Tours Document and/or Evaluate Existing Conditions	Achieve Consensus on Goals and Objectives Establish MOUs with Partners Regarding Resource-Sharing Establish MOUs with Partners Regarding Incident Management Establish Procedures for Collaboration Outreach to Stakeholders and Partners Establish MOUs with Partners Regarding TIM, Work Zones, Signals, etc.	Select Performance Measures Establish Procedures for Performance Reporting Select Performance Targets Identify Potential Performance Reporting Improvements Develop Standards and/or Guidelines for Data Reporting Establish MOUs with Partners Regarding Data Sharing	Outreach to Decision Makers Outreach to Executive Staff, MPOs, Local Agencies, and Private Partners Outreach to the Public Training and Workforce Development	Identify Funding Strategies and Sources Implement Staffing and Retention Strategies Integrate into Staffing Plans Identify Funding Sources and/or Strategies Implement Funding Strategies Conduct Inventory of Agency Resources	Identify Strategies to Implement TSMO Identify Potential Procedural Improvements Identify Strategies to Implement Improvements Integrate into Maintenance Planning Integrate into Planning Identify and/or Prioritize Relevant TSMO Strategies	Update Mission/Vision to TSMO Develop or Adjust Business Processes to TSMO Performance Metrics and Data Analytics Perform Gap Analysis Conduct Another CMM Consultants
Involved Parties <i>Check off listed collaborators or enter your own</i>	<input checked="" type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff FHWA 	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff Design Construction Maintenance	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff Design Construction Maintenance	<input type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff External Partners Law Enforcement FHWA	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff Design Construction Maintenance	<input type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff FHWA 	<input type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff Design Construction Maintenance	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff Design Construction Maintenance
Notes <i>Additional details or explanation of task activities, outcomes, and results</i>			More collaborators: FHWA	More collaborators: Academia Legislators • Performance Measures • Benefit/Cost	More collaborators: FHWA			More collaborators: FHWA

Figure 4-4. Group 2 framework for “Build Your Own” TSMO Program Planning Framework exercise (statewide group).

TSMO Program Plan Framework

National NCHRP Workshop, February 25–26, 2016

Steps <i>to develop and implement the TSMO plan</i>	Set up Process and Steering Committee	Communication and Education	Mission, Vision, Goals, Objectives	Needs Assessment	Performance Measures to Support Goals/Objectives	Resources and Staffing	Implement Plan	
Key Objectives and Activities <i>Use provided building blocks or enter your own</i>	Achieve Consensus on Goals and Objectives Achieve Consensus on Scope, Schedule, Budget Identify Stakeholders Staff/Consultant to Write Plan Identify Champions "All In" (Solidify Commitments)	Outreach to External Stakeholders and Partners Outreach to Decision Makers Outreach to the Public Outreach to Agency Leadership	Update Mission/Vision Set Goals and Objectives • • • •	Document Current Agency Practices, Methods, and Culture Identify and/or Prioritize Relevant TSMO Strategies Identify Strategies to Implement Improvements Set Priorities • •	Select Performance Measures Select Performance Targets Develop Standards and/or Guidelines for Data Reporting Establish Procedures for Performance Reporting Identify Potential Performance Reporting Improvements •	Conduct Inventory of Agency Resources Identify Required Resources and/or Investments Identify Funding Strategies and Sources Develop Staffing Plan and Define Roles/Responsibilities Identify Staffing Requirements Identify Potential Cultural Improvements •	List Potential Institutional and Cultural Improvements Develop and/or Implement Training Programs Identify Staffing and Retention Strategies Implement Funding Strategies • •	• • • • •
Involved Parties <i>Check off listed collaborators or enter your own</i>	<input checked="" type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff Districts & Regions _____ _____	<input checked="" type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff Public Info. Officer _____ _____	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff _____ _____	<input checked="" type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff Maintenance _____ _____	<input type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff Information Technology _____ _____	<input type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff Human Resources Information Technology _____ _____	<input type="checkbox"/> DOT Leadership <input checked="" type="checkbox"/> Operations Staff <input checked="" type="checkbox"/> Planning Staff Traffic Engineering _____ _____	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff _____ _____
Notes <i>Additional details or explanation of task activities, outcomes, and results</i>	Location Location Location							

Figure 4-5. Group 3 framework for "Build Your Own" TSMO Program Planning Framework exercise (statewide group).

TSMO Program Plan Framework

National NCHRP Workshop, February 25–26, 2016

Steps <i>to develop and implement the TSMO plan</i>	Mission/ Vision	Define TSMO	Goals/ Objectives	Performance Metrics	Business Processes	Organization, Staffing, and Resources	Systems and Technology	Collaboration
Key Objectives and Activities <i>Use provided building blocks or enter your own</i>	Update Mission/Vision for Overall Agency Alignment ● ● ● ● ●	Define the Term: TSMO Identify and/or Prioritize Relevant TSMO Strategies ● ● ● ●	Identify Potential Cultural Improvements Identify Potential Institutional Improvements Achieve Consensus on Goals and Objectives Integrate into Planning Processes Set Objectives for the Goals ●	Conduct Inventory of Data Document and/or Evaluate Existing Conditions Select Performance Measures Select Performance Targets Develop Standards and/or Guidelines for Data Reporting Establish Procedures for Performance Reporting ●	Document Current Agency Practices and Methods Develop or Adjust Business Processes ● ● ● ●	Conduct Inventory of Agency Resources Identify Staffing Requirements Develop Staffing Plan and Define Roles/Responsibilities Implement Staffing and Retention Strategies Develop and/or Implement Training Programs Identify Staffing and Retention Strategies ●	Develop Standards and/or Guidelines for Technology Define and Identify Strategies Update and Use ITS Architecture Strategies for Autonomous Vehicles and Connected Vehicles ●	Establish Procedures for Collaboration Outreach to Stakeholders and Partners Establish MOUs with Partners Regarding Resource-Sharing Establish MOUs with Partners Regarding Incident Management Establish MOUs with Partners Regarding Data Sharing ●
Involved Parties <i>Check off listed collaborators or enter your own</i>	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff _____ _____ _____	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff _____ _____ _____	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff _____ _____ _____	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff _____ _____ _____	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff _____ _____ _____	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff _____ _____ _____	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff _____ _____ _____	<input type="checkbox"/> DOT Leadership <input type="checkbox"/> Operations Staff <input type="checkbox"/> Planning Staff _____ _____ _____
Notes <i>Additional details or explanation of task activities, outcomes, and results</i>	Before This Step: Perform Literature Review of Best Practices							After This Step: Outreach to Decision Makers

Figure 4-6. Group 4 framework for “Build Your Own” TSMO Program Planning Framework exercise (statewide group).

Gaining Consensus on the Unified TSMO Program Planning Framework

The project team analyzed the four different frameworks from the “Build Your Own” TSMO Program Planning Framework exercise to identify common trends and themes in the frameworks’ “steps,” which were then used to construct a consolidated Draft Consensus Framework based on the similar steps across most or all of the frameworks (see Table 4-1). For example, all four groups’ frameworks contained at least one step that addressed defining the mission, vision, goals, and objectives for a TSMO program plan. These steps were consolidated into the Mission, Vision, Goals, and Objectives component in the Draft Consensus Framework. Similarly, all four groups had a step related to performance measurement, which was represented in the Performance Measures component of the Draft Consensus Framework. Some components in the Draft Consensus Framework, such as Evaluation and Reassessment, were included in only two group’s frameworks; however, significant support for this step was expressed during the presentation of the frameworks. The Draft Consensus Framework classified the common steps as either framework components or process steps, reflecting whether they were more closely associated with general topics for inclusion in a TSMO program plan document (i.e., framework components) or with processes for developing the plan and implementing the framework successfully (i.e., process steps). This Draft Consensus Framework was used to launch and facilitate the group’s Day 2 discussion on what should be included in the Unified TSMO Program Planning Framework.

The Draft Consensus Framework represented a key turning point in validating and creating the Unified TSMO Program Planning Framework in two ways. First, it helped validate, through group consensus, that many aspects of the NCHRP 20-07 (345) and the CMM frameworks should be included in the Unified TSMO Program Planning Framework – as many of the framework components align with the five NCHRP 20-07 (345) components as well as the six CMM dimensions. Second, the Draft Consensus Framework confirmed the importance of having a process layer in the Unified TSMO Program Planning Framework. As shown in the workshop groups’ frameworks – and supported in the discussion that ensued – process steps such as outreach and collaboration are essential to the framework and will help guide agencies through the entire, ongoing TSMO program planning process.

Table 4-1. Draft consensus TSMO program planning framework, based on the four frameworks developed by the workshop groups during the “Build Your Own” TSMO Program Plan Framework exercise.

Draft Consensus TSMO Program Planning Framework (Result of Day 1 Workshop Activities)	
Framework Components	Process Steps
Mission, Vision, Goals, and Objectives	Set Up Steering Committee
Performance Measures	Outreach and Collaboration
Staffing Resources	
Funding Resources	
Implementation Services and Projects	
Roles and Responsibilities	
Evaluation and Reassessment	

To provide additional insight into the composite sequencing and selection of objectives and activities for the Unified TSMO Program Plan Framework, based on the frameworks that the four groups developed during the “Build Your Own” Framework exercise, Figure 4-7 presents a chart that graphically summarizes the actions that each group included in its TSMO program plan framework, and indicates both the timing of the action (i.e., whether the groups tended to mention the action earlier or later in the framework steps) and the significance of the action (i.e., how often the action was mentioned by the groups). The positioning of items along the vertical dimension indicates whether that item generally occurred earlier (higher up) or later (lower down) in the groups’ frameworks, while the horizontal positioning on the chart indicates whether that item was mentioned more frequently (farther right) or less frequently (farther left). The items are color-coded according to how much agreement there was between the four groups regarding the precise vertical placement of the item (i.e., with respect to timing).

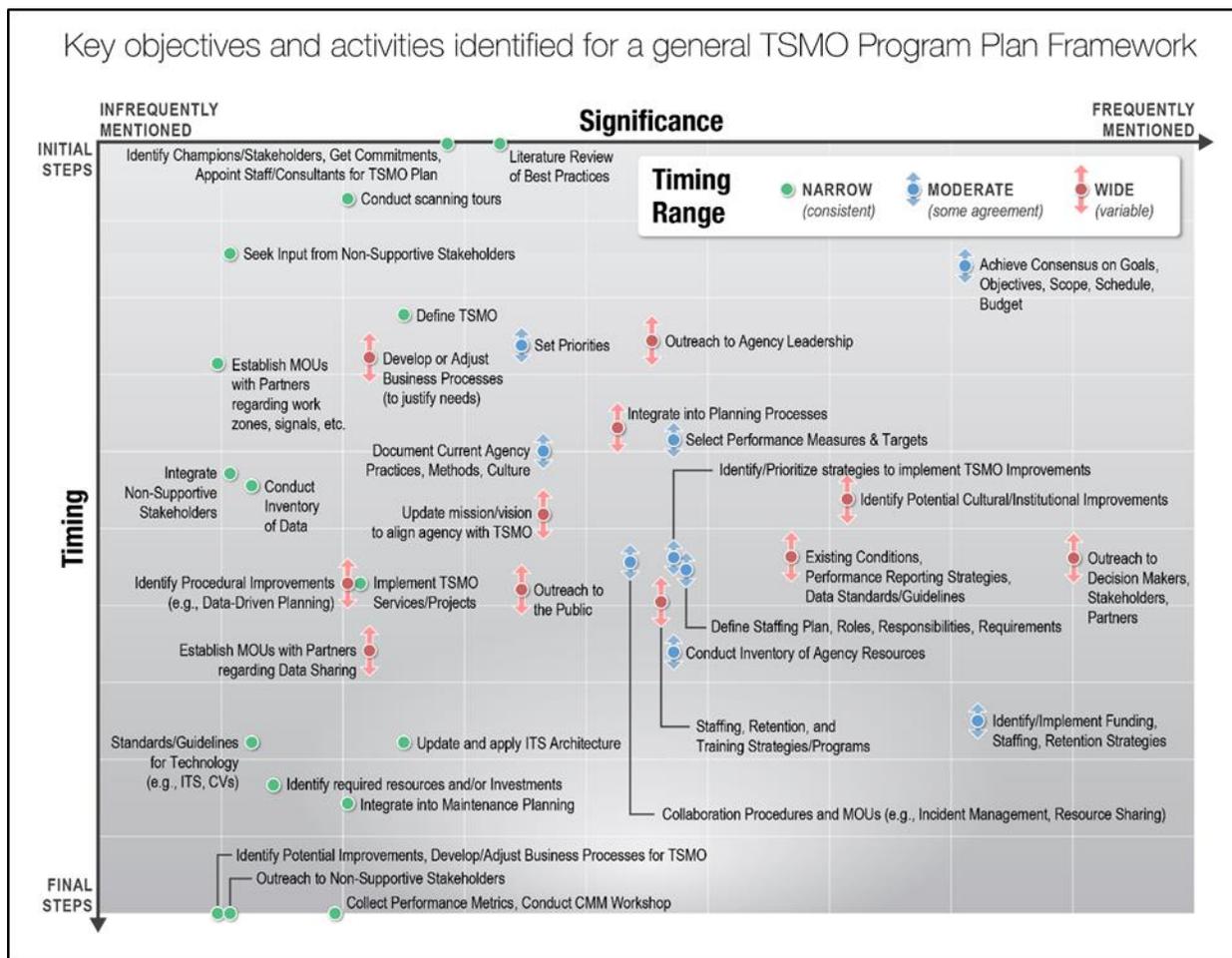


Figure 4-7. Key objectives and activities identified across all four TSMO program planning boards during the workshop exercise.

Based on the summary of findings presented in Figure 4-7, the following are the key objectives and activities that were frequently cited by the groups in their TSMO Program Plan frameworks, with earlier framework steps/elements listed first.

- Achieve Consensus on Goals, Objectives, Scope, Schedule, Budget.
- Outreach to Agency Leadership.
- Integrate into Planning Processes.

- Select Performance Measures and Targets.
- Identify Potential Cultural/Institutional Improvements.
- Identify/Prioritize Strategies to Implement TSMO Improvements.
- Develop Collaboration Procedures and MOUs (e.g., Incident Management).
- Outreach to Decision-makers, Stakeholders, Partners.
- Assess Existing Conditions.
- Identify Performance Reporting Strategies.
- Develop Data Standards/Guidelines.
- Define Staffing Plan, Roles, Responsibilities, Requirements.
- Develop Staffing, Retention, and Training Strategies/Programs.
- Conduct Inventory of Agency Resources.
- Identify and Implement Funding Strategies, Retention Strategies.

Resources for Advancing TSMO

After achieving consensus on the Unified TSMO Program Planning Framework, the group discussed which resources public agencies need to make TSMO program planning a reality. These were generally organized into one of two categories: documentation of best practices and sharing of materials from peer states and development of new types of resources and tools for planning, facilitation, and consensus building.

Though the best method of conveying each type of information may vary, the group recommended that a collaborative Internet-based resource (e.g., a moderated, wiki type of environment) be considered as a leading candidate for peer exchange, including the sharing of best practices and lessons learned. The path forward for such a tool, however, was not clear as it would require an organization to take ownership of the wiki and provide monitoring/guidance as needed. To maximize its utility, the wiki also would need integrated and publicized in locations that TSMO planners and operations staff already are routinely checking.

Peer Exchange and Sharing of Best Practices

Much of the discussion centered on strategies, methods, and formats for sharing best practices and lessons learned through agency experience. Participants noted that the following information and materials would be particularly useful.

- Best practices for advancing levels within each CMM dimension.
- TSMO publicity materials, especially videos. For example, a video of agency and/or political leaders discussing the benefits of TSMO. This also includes TSMO outreach and publicity materials that could be used while a TSMO program plan is being developed, for establishing support and initial education.
- Scope of Work descriptions for agencies that used consultants to help generate their TSMO program plan; and
- Peer-to-peer meetings on TSMO program plan development and implementation.

Resources and Tools for Planning, Facilitation, and Consensus Building

The discussion also covered new materials and other resources that participants would find valuable if developed and made available to them. The following list indicates the most significant requests and ideas from the workshop participants.

- A virtual, interactive version of the boards used in the “Build Your Own” TSMO Program Plan exercise.
- Training programs for creating TSMO program plans.

- Guidelines for implementing TSMO program plans, including the integration of the plan into other organizational processes and programs (e.g., Transportation Improvement Plans or Strategic Highway Safety Plans).
- Maps showing which states and regions have created or currently are developing TSMO program plans, to help build momentum across the country and promote collaboration.

Key Findings from the Workshop

The following is a summary of specific findings from the two-day workshop that are directly relevant or applicable to the structure or content of the Unified TSMO Program Planning Framework.

- TSMO Business Case Justification.
 - Key benefits to emphasize include:
 - TSMO strategies are more cost-effective than traditional strategies, and can be built up gradually over time rather than requiring a full-scale initial investment.
 - TSMO strategies can generally be implemented and deployed in much shorter timeframes than traditional capital strategies.
 - TSMO strategies already are aligned with many common agency goals and priorities (e.g., enhancing safety), and are complementary to existing initiatives (e.g., incident management).
 - Concrete examples and quantitative results make a more powerful case.
 - Emphasize that TSMO is a strategy that should complement, rather than compete against, other projects and improvements.
 - Be prepared to provide references and supporting documentation. Ensure that the references provided are concise and cogent.
 - TSMO Draft and Final Consensus Framework feedback, comments, and findings.
 - It would be valuable to provide agencies with guidance regarding which components of the framework are likely to apply to agencies with lower or higher levels of CMM capability maturity.
 - A sample outline for a full TSMO program plan would be valuable, as would a discussion of the linkages between these chapters/sections and the elements of the overall Unified TSMO Program Planning Framework.
 - As part of the framework development group exercise, a consensus TSMO program planning framework was established. It included the following items:
 - Mission, vision, goals, and objectives;
 - Performance measures;
 - Staffing;
 - Funding;
 - Implementation of Services and Projects;
 - Roles and Responsibilities; and
 - Evaluation and Reassessment.
 - The following steps were consistently identified by workshop participants as being important for facilitating the TSMO program plan development process:
 - Setting up a steering committee.
 - Conducting outreach.
 - Collaborating with partners and stakeholders.
 - Peer exchange continued to be a key priority action for the sharing of best practices and lessons learned regarding TSMO Program Plan development and implementation. Resource sharing by agencies that have successfully completed their own TSMO Program Plans also would be valuable, including the sharing of:
 - Scope-of-work descriptions for agencies that will rely on consultants to help assemble their TSMO plans.
 - TSMO materials for publicity, outreach, and business case justification.

- To facilitate peer exchange, it would be helpful to have a nationwide database of TSMO Program Plan activities and progress at DOTs and other agencies.

CHAPTER 5

Synthesis of Findings and the Unified TSMO Program Planning Framework

This chapter presents the Unified TSMO Program Planning Framework that synthesizes all project findings into a single, comprehensive reference for TSMO program planning that is validated by the results of the national survey and the workshop. The most important contributing elements that were considered in developing this Unified TSMO Program Planning Framework from each of the preceding chapters are summarized in the following locations:

- **Chapter 2:** Table 2-1 and Table 2-3.
- **Chapter 3:** the concluding “General Insights” section at the end of the chapter.
- **Chapter 4:** the concluding “Key Findings” section at the end of the chapter.

Unified TSMO Program Planning Framework

The Unified TSMO Program Planning Framework is designed to be comprehensive, taking into account all of the above mentioned sources of information and insights which were gathered from a diverse set of agencies with respect to size, TSMO capability maturity, geographic location, and TSMO program planning progress to date. This framework is strategically designed to be flexible enough that any agency can adapt it to fit its specific context, needs, constraints, and goals.

Relationship to Earlier TSMO Frameworks

To demonstrate the alignment and evolution between 1) the initial NCHRP 20-07 (345) framework, 2) the Draft Consensus Framework from Day 1 of NCHRP 20-07 Task 365 workshop, and 3) the final Unified TSMO Program Planning Framework, Table 5-1 lists the main components of each framework and indicates how the components of the earlier frameworks relate to the components of the Unified Framework (the components of the Unified Framework are symbolized A through H; parentheses after each component in the earlier framework show how the given component aligns with the Unified Framework). As illustrated by the table, the final Unified TSMO Program Planning Framework is very closely aligned with both of these reference frameworks in sequence and content, and does not omit any elements from either source.

Table 5-1. Correspondence between components of the two earlier frameworks and the final Unified TSMO Program Planning Framework.

NCHRP 20-07 (345) Framework^a	Draft Consensus Framework^a	Unified TSMO Program Planning Framework
<i>Framework Coming into the Workshop</i>	<i>Framework after Day 1 of the Workshop</i>	<i>Unified, Agreed-Upon Framework at the End of the Workshop</i>
<ul style="list-style-type: none"> • Mission, Vision, Goals, Objectives, and Performance Measures (A, B) • Leadership and Organization (C) • Business Processes (D) • Resources (Financial, Human, Infrastructure, Technology) (E) • Packages of Services, Projects, and Activities with Related Policies and Guidelines (F) 	<ul style="list-style-type: none"> • Mission, Vision, Goals, and Objectives (A) • Performance Measures (B) • Staffing Resources (C, E) • Funding Resources (E) • Implementation of Services and Projects (F) • Roles and Responsibilities (G) • Evaluation and Reassessment (H) 	<ul style="list-style-type: none"> • Mission, Vision, Goals, and Objectives • Performance Measurement • Leadership, Organization, and Staffing • Business Processes and Planning • Resource Positioning and Development • Services and Projects • Roles and Responsibilities • Evaluation and Reassessment

^a Parentheses indicate which component from the Final Unified TSMO Program Planning Framework (A through H) corresponds to each components of the earlier frameworks.

Final Unified TSMO Program Planning Framework

The high-level components of the Unified TSMO Program Planning Framework (reproduced from the bolded third column in Table 5-1) are listed and described in detail in the first column of Table 5-2 below, again identified by the labels A through H. There also is an unlabeled foundational prerequisites component that establishes a foundation for the rest of the Unified TSMO Program Planning Framework, but does not contribute directly to any contents of the resultant TSMO Program Plan itself. The second column of Table 5-2 then lists several key process steps (not exhaustive) that are expected to occur within each component of the framework, followed by the related chapters and topics of the resultant, actual TSMO Program Plan (the “program plan elements”) in the third column (labeled by the numbers 1-23). The distinction between process steps and program plan elements for each component in the Unified TSMO Program Planning Framework reflects and formalizes the project’s key finding that TSMO program planning processes need to be integrated into the framework along with elements/contents of the actual TSMO Program Plan. The entire Unified Framework (meaning the components, process steps, and program plan elements) is designed to be flexible, with the expectation that agencies will tailor each aspect to best fit their individual needs.

Table 5-2. An overview of the Unified TSMO Program Planning Framework.

Framework Component	Anticipated Process Steps (not exhaustive)	Sample TSMO Program Plan Elements
<p>Foundational prerequisites – Laying the groundwork to ensure the TSMO Program Plan development process is properly scoped and supported, including staff support, time and resource commitments, and leadership endorsement. This component involves identifying the core team and ensuring that a feasible management plan is in place to govern the rest of the framework and steps.</p>	<ul style="list-style-type: none"> • Identify TSMO champion(s). • Get commitments from key staff and stakeholders (the full framework and process can be expected to take 1-2 years to fulfill). • Appoint staff or organizations for TSMO Program Plan development responsibility (typically led by operations divisions). • Establish TSMO Program Plan steering committee. • Secure the authority to make changes necessary for the successful design and implementation of the TSMO Program Plan. 	<p>N/A</p>
<p>A. Mission, Vision, Goals, and Objectives – Establishing the high-level outcomes and setting expectations for the plan, to provide a common, clear direction for all of the components and steps that follow. This component ensures that all stakeholders and partners are like-minded in the understanding of what TSMO and the program plan will do, why it is necessary, and how it will benefit each entity.</p>	<ul style="list-style-type: none"> • Achieve consensus on goals, objectives, scope, schedule, budget. • Outreach to Agency Leadership, internal staff, and the public. • Outreach to decision-makers, stakeholders, partners. • Update mission/vision to align with TSMO. • Define TSMO. • Define role of TSMO. Program Plan in context of other planning documents. 	<ol style="list-style-type: none"> 1. Consensus set of goals, objectives, and vision for TSMO. 2. Definition of TSMO (including scope and role, including in the context of other plans).
<p>B. Performance Measurement – Sets context for TSMO and the Program Plan, and gives greater definition to the high-level goal outcomes already established. This component</p>	<ul style="list-style-type: none"> • Select performance measures and targets • Assess existing conditions. • Identify performance reporting strategies. • Set priorities. 	<ol style="list-style-type: none"> 3. Presentation of performance targets and priorities. 4. Characterization of current conditions.

Framework Component	Anticipated Process Steps <i>(not exhaustive)</i>	Sample TSMO Program Plan Elements
provides tangible descriptions of the current state and goal state.		
C. Leadership, Organization, and Staffing – Addresses foundational staff structure requirements necessary to support TSMO, thereby enabling the successful implementation of various operational and management strategies as they are adopted. This component ensures that technical and administrative support for TSMO is available at all levels of the organization.	<ul style="list-style-type: none"> • Outreach to Agency Leadership, internal staff. • Identify potential institutional improvements. • Identify and implement strategies to promote TSMO culture. • Develop staff retention strategies/programs. • Define overall staffing plan and organization. 	<ol style="list-style-type: none"> 5. Description of career development plans for TSMO staff. 6. Description of staff organization and reporting structure. 7. Formal statement of endorsement from leadership.
D. Business Processes and Planning – Performs key integration of TSMO considerations into existing institutional processes, for systematic treatment according to well defined and documented procedures. Current shortcomings of agency processes regarding TSMO concepts are identified and addressed in this step.	<ul style="list-style-type: none"> • Integrate TSMO into planning processes. • Document agency TSMO practices, methods. • Develop or adjust business processes to include TSMO. • Identify procedural improvements for data-driven planning. • Integrate TSMO into Maintenance planning 	<ol style="list-style-type: none"> 8. Discussion of updates to planning processes (including programming, maintenance, project prioritization, etc.) to include TSMO and performance measures. 9. Documentation of agency practices for ensuring proper consideration of TSMO.
E. Resource Positioning and Development – Defines the technical and financial resources available and required to support the high-level general format and needs of TSMO services and projects, such as data systems, infrastructure, and funding sources. For any needs that are not yet met, this component quantifies the gaps between the present and future goal states, and develops implementable	<ul style="list-style-type: none"> • Outreach to Agency Leadership, internal staff. • Develop data standards/guidelines. • Conduct inventory and gap analysis of agency resources. • Identify and implement funding strategies. • Update and apply ITS architecture. • Identify required resources and investments. • Conduct inventory of data. 	<ol style="list-style-type: none"> 10. Description of current data resources, standards, and support systems. 11. Documentation of TSMO inventory. 12. Identification of resource gaps and needs. 13. Discussion of current, anticipated future, and potential future funding sources. 14. Presentation of updated ITS Architecture to accommodate needs of TSMO.

Framework Component	Anticipated Process Steps <i>(not exhaustive)</i>	Sample TSMO Program Plan Elements
<p>strategies to address them.</p> <p>F. Services and Projects – Develops a set of tangible initiatives and solutions in pursuit of the performance targets and goals/vision set earlier, subject to any inflexible practical constraints identified as part of previous framework components. Depending on the outcomes from this framework component, it may be necessary to revisit and update previous components to some degree.</p>	<ul style="list-style-type: none"> • Outreach to stakeholders and partners. • Implement TSMO services/projects. • Identify/Prioritize strategies to implement TSMO improvements. 	<p>15. Describe services and projects to meet TSMO goals and objectives.</p> <p>16. Map services and projects to resource needs (including funding), performance targets, and relevant staff (including roles).</p> <p>17. Develop implementation plan (e.g., phases, initial steps, near-term goals) for services and projects.</p>
<p>G. Roles and Responsibilities – Covers the required staff support elements of the services and projects from the previous component, including considerations of training, policies, and formal documentation. This component applies to staff both internally and at partner agencies/organizations.</p>	<ul style="list-style-type: none"> • Outreach to stakeholders, partners, and internal staff. • Define roles, responsibilities, position requirements. • Develop Staff Training Strategies/Programs. • Establish MOUs with partners regarding data sharing, resource sharing, incident management, etc. 	<p>18. Documentation or summaries of MOUs with partner agencies to support various services and projects.</p> <p>19. Description of staff roles and responsibilities with respect to TSMO business processes, services, and projects.</p> <p>20. Description of training program(s) for TSMO staff.</p>
<p>H. Evaluation and Reassessment – Ensures that the services and projects are effective at realizing progress toward the goals and targets established previously, and captures mechanisms and methods for ongoing monitoring and continual improvement of TSMO and the Program Plan.</p>	<ul style="list-style-type: none"> • Assess existing conditions • Collect postperformance metrics. • Conduct follow-up CMM workshop. • Outreach to decision-makers, stakeholders, partners, public. • Establish reporting requirements and procedures. 	<p>21. Plan for ongoing performance measurement and reporting.</p> <p>22. Discussion of schedule or trigger for next CMM evaluation.</p> <p>23. Schedule and staff responsibilities for updating TSMO Program Plan.</p>

Program Plan Contents

To demonstrate the alignment and evolution between the program plan content in the Unified TSMO Program Planning Framework (as shown in the third column of Table 5-2, labeled by the numbers 1-23) and the key elements of a TSMO program plan identified by respondents who participated in the national

survey (the elements shown in Chapter 3, Figure 3-10), the list below shows how each TSMO program plan element from the survey corresponds with the program plan content in the Unified Framework. As the list confirms, all of the topics that were cited as “important” or “very important” by a majority of respondents in the national survey have some degree of treatment in the Unified TSMO Program Planning Framework, being captured by either the steps associated with each framework component, or by the resultant TSMO Program Plan itself.

Key Elements of a TSMO Program Plan from the National Survey (see Figure 3-10), and their alignment with the program plan contents in the Unified TSMO Program Planning Framework:

- **Goals and objectives:** Unified Framework program plan content element #1 – Consensus set of goals, objectives, and vision for TSMO.
- **Mission/vision statement:** Unified Framework program plan content element #1 – Consensus set of goals, objectives, and vision for TSMO.
- **Organizational roles and responsibilities:** Unified Framework program plan content element #19 – Description of staff roles and responsibilities with respect to TSMO business processes, services, and projects.
- **Implementation plan:** Unified Framework program plan content element #17 – Develop implementation plan (e.g., phases, initial steps, near-term goals) for services and projects.
- **Resource requirements:** Unified Framework program plan content element #12 – Identification of resource gaps and needs.
- **Discussion of CMM dimensions:** See next section the Unified Framework Process Steps
- **Stakeholder roles and responsibilities:** Unified Framework program plan content element #18 – Documentation or summaries of MOUs with partner agencies to support various services and projects.
- **CMM action items:** See next section the Unified Framework Process Steps
- **Performance measures:** Unified Framework program plan content element #3 – Presentation of performance targets and priorities.
- **Business case for TSMO:** Captured by outreach steps, but not included as a section in the Program Plan itself.
- **Summary of existing conditions:** Unified Framework program plan content element #4 – Characterization of current conditions.
 - Unified Framework program plan content element #13 – Discussion of current, anticipated future, and potential future funding sources.
- **Staffing, job descriptions, career development and succession plans:** Framework program plan content elements #5 – Description of career development plans for TSMO staff; and #19 – Description of staff roles and responsibilities with respect to TSMO business processes, services, and projects.
- **TSMO plan maintenance:** Unified Framework program plan content element #23 – Schedule and staff responsibilities for updating TSMO Program Plan.
- **Project development processes:** Unified Framework program plan content element #8 – Discussion of updates to planning processes (including programming, maintenance, project prioritization, etc.) to include TSMO and performance measures.
- **Agency reorganization:** Unified Framework program plan content element #6 – Description of staff organization and reporting structure.

CMM Framework and the Unified TSMO Program Planning Framework

Table 5-3 below explores the correspondence between the capability maturity model (CMM) workshop dimensions, the most common implementation plan priority actions associated with each one, and the var-

ious components and steps of the final Unified TSMO Program Planning Framework. Note that all of the dimensions and common priority actions are addressed by at least one of the framework components, or by the framework as a whole.

As culture was identified as the most challenging CMM dimension to address and improve, the foundational prerequisite component of the framework seeks to promote internal and external awareness of the merits and value of TSMO. This increased appreciation and awareness is bolstered by additional outreach efforts in Framework Components A, C, E, F, G, and H. Altogether, these activities are expected to foster growth in the cultural dimension of the TSMO CMM framework at several key points of the TSMO Program Plan development process.

Table 5-3. Correspondence between common priority action items for advancing TSMO by CMM dimension, and the related-process steps associated with the Unified TSMO Program Plan Framework.

CMM Dimension	Common CMM Implementation Plan Priority Action	Representation in the Unified Framework
Business Processes	Developing and communicating a regional/statewide "TSMO Program Plan."	Overall Framework
Business Processes	Integrating TSMO into statewide long-range plans and transportation improvement programs.	Framework Component A: <ul style="list-style-type: none"> Define role of program plan in context of other planning documents.
Systems and Technology	Working with state IT departments regarding the special technical requirements of ITS, including appropriate standards, specifications, procurement processes, vendor lists, and general streamlining of approaches.	Framework Component E: <ul style="list-style-type: none"> Develop data standards/guidelines.
Systems and Technology	Updating and documenting their existing systems architectures.	Framework Component E: <ul style="list-style-type: none"> Update and apply ITS architecture.
Systems and Technology	Taking a more formal systems engineering approach to new TSMO applications with multi-jurisdictional and/or new technology challenges.	Framework Component E: <ul style="list-style-type: none"> Identify required resources and investments.
Performance Measurement	Creating a comprehensive performance measurement system (definitions and measures, related data and analytics targets).	Framework Component B: <ul style="list-style-type: none"> Select performance measures and targets. Assess existing conditions. Identify performance reporting strategies. Set priorities.
Performance Measurement	Promoting operations in traditional planning and programming processes.	Framework Component D: <ul style="list-style-type: none"> Identify procedural improvements for data-driven planning.
Performance Measurement	Creating a communication strategy for describing the benefits of TSMO to upper management and the public.	Framework Components A, H: <ul style="list-style-type: none"> Outreach to decision-makers, stakeholders, partners, public.
Culture	Preparing a TSMO business case.	Framework Components A, H: <ul style="list-style-type: none"> Outreach to decision-makers, stakeholders, partners, public.
Culture	Campaigning to increase awareness of and appreciation/support for TSMO, both internally	Framework Components A, H: <ul style="list-style-type: none"> Outreach to decision-makers,

CMM Dimension	Common CMM Implementation Plan Priority Action	Representation in the Unified Framework
	and externally.	stakeholders, partners, public
Organization and Staffing	Consolidating related organizational units.	Framework Component C: <ul style="list-style-type: none"> Define overall staffing plan and organization.
Organization and Staffing	Creating TSMO staffing plans, potentially including identification of core staff capacities, position descriptions, and succession plans.	Framework Component C, G: <ul style="list-style-type: none"> Define overall staffing plan. Define roles, responsibilities, position requirements. Develop staff retention strategies/ programs. Define overall staffing plan and organization.
Collaboration	Establishing a forum and/or formal agreements to support better interagency relationships, especially for incident management.	Framework Component G: <ul style="list-style-type: none"> Establish MOUs with partners regarding data sharing, resource sharing, incident management, etc.
Collaboration	Placing greater emphasis on reliability performance measurement.	Framework Component B: <ul style="list-style-type: none"> Select performance measures and targets. Set priorities.

Supporting Resources

As identified during the project's two-day workshop, the following resources are available or anticipated in the near future to support agencies as they embark upon their own efforts to develop and implement their specific TSMO Program Plans.

Documents

- Advancing TSMO Through Scenario Planning – Currently available on-line at <http://www.ops.fhwa.dot.gov/publications/fhwahop16016/ch1.htm>.
- NCHRP has released a TSMO Asset Management document that is relevant to TSMO Program Plan development.
- Planning for TSMO within Corridors – Expected to be available soon, and will address specific considerations related to agency size (with emphasis on smaller agencies).
- FHWA TSMO Program Planning Primer – Expected to be available soon.
- Planning through Resilience for Operations – Expected to be available soon.

Peer Exchange

Peer exchange was consistently cited in the national survey and two-day workshop as one of the most valuable potential sources of guidance and assistance for agencies as they plan, develop, and implement their own TSMO Program Plans. More specifically, it can be a valuable tool for the sharing of resources and information (e.g., best practices, lessons learned) regarding each of the specific topics identified by survey respondents and workshop participants, which are listed in Table 5-4 and organized according to the most relevant framework component(s) of each. It should be noted that while some topics are

associated with more than one component of the framework (i.e., the business case topics and the outreach topic), each peer review topic fits into at least one.

Table 5-4. The relevance of various Peer Exchange Topics in the Unified TSMO Program Planning Framework.

Unified Framework Component	Associated Peer Exchange Topics
<i>Foundational prerequisites</i>	<ul style="list-style-type: none"> • Opportunities for staff to learn more about TSMO program planning. • Specific or updated best practices for creating TSMO program plans. • Scope-of-work descriptions for agencies that will rely on consultants to help assemble their TSMO plans.
A. Mission, Vision, Goals, and Objectives	<ul style="list-style-type: none"> • Strategies other agencies have used to clearly define the objectives and goals of the TSMO Program Plan, to distinguish it from what the Operations Division currently does. • TSMO-specific outreach strategies for internal or external stakeholders. • Demonstrations of the benefits and costs of TSMO program planning in other state and regions, for external outreach purposes. • Guidance for developing business case materials or working with legislators, for external outreach purposes.
B. Performance Measurement	<ul style="list-style-type: none"> • Strategies other agencies have used to successfully incorporate TSMO performance measures into their TSMO Program Plans.
C. Leadership, Organization, and Staffing	<ul style="list-style-type: none"> • Strategies other agencies have used to successfully justify additional staffing and resources to executive management. • Strategies other agencies have used to successfully perform a TSMO-oriented agency reorganization or restructuring. • TSMO-specific outreach strategies for internal or external stakeholders.
D. Business Processes and Planning	<ul style="list-style-type: none"> • Strategies other agencies have used to restructure their main business processes to incorporate TSMO, and to integrate TSMO into the DOT capital programming process.
E. Resource Positioning and Development	<ul style="list-style-type: none"> • Opportunities to obtain funding and other resources for TSMO program planning. • TSMO-specific outreach strategies for internal or external stakeholders.
F. Services and Projects	<ul style="list-style-type: none"> • Additional information on TSMO strategies (which provides insight into the estimation of resource requirements and other outcomes). • Strategies other agencies have used to successfully develop a phased implementation plan at the MPO level, as well as TSMO program plan implementation strategies in general. • TSMO-specific outreach strategies for internal or external stakeholders. • Demonstrations of the benefits and costs of TSMO program planning

Unified Framework Component	Associated Peer Exchange Topics
	in other state and regions, for external outreach purposes. <ul style="list-style-type: none"> • Guidance for developing business case materials or working with legislators, for external outreach purposes.
G. Roles and Responsibilities	<ul style="list-style-type: none"> • Strategies other agencies have used to successfully established TSMO knowledge transfer tools and training materials. • TSMO-specific outreach strategies for internal or external stakeholders.
H. Evaluation and Reassessment	<ul style="list-style-type: none"> • TSMO-specific outreach strategies for internal or external stakeholders. • Demonstrations of the benefits and costs of TSMO program planning in other state and regions, for external outreach purposes. • Guidance for developing business case materials or working with legislators, for external outreach purposes.

Table 5-5 highlights the TSMO activities and progress regarding TSMO Program Plans at several agencies across the country. It is expected that this list will grow in the coming months and years, as an increasing number of agencies embark upon their own TSMO Program Plan development efforts. Given that the agencies listed in Table 5-6 already have taken tangible steps toward completing their own TSMO Program Plans, however, these are expected to be some of the most likely contributors to peer exchanges and TSMO resource sharing activities in the near term.

Table 5-5. Partial listing of current and recent TSMO Plan activities in the United States.

Agency	TSMO Plan Status	Additional Context
Arizona DOT	In the planning stages	Statewide focus.

Agency	TSMO Plan Status	Additional Context
Kansas DOT	In the planning stages	Plan will focus on the Wichita area.
Delaware Valley Regional Planning Commission	Consolidating regional TSMO plans into a single document	Plan applies to a region that spans two states.
Pennsylvania DOT	Anticipated completion in 2017	
Colorado DOT	Completed in late 2013	Resulted in the reorganization of the DOT.
Caltrans	In the planning stages	
Missouri DOT	Estimated completion in the summer of 2016	Focus on outreach to MoDOT districts
Michigan DOT	Anticipated completion in 2017	Focus on developing the business case.
Iowa DOT	TSMO plan completed and adopted	Organized into three parts: a strategic plan, a program plan, and service-specific details.
Maryland DOT	Has a limited TSMO strategic plan	Not a full program plan.
South Dakota DOT	In progress	Collaborative effort between the State, MPOs, and other partners. Rural focus.
Tennessee DOT	Consolidating several TSMO plans into a single document	Called a Traffic Operations Systems Plan.

CHAPTER 6

Moving Forward

This chapter provides guidance regarding the ongoing maintenance of the Unified TSMO Program Planning Framework, to ensure that it continues to provide agencies and practitioners with current, relevant, and valuable guidance regarding TSMO program planning. It also includes a discussion of the actions that staff can take to promote the success of TSMO program plans at their agencies and among partner and peer organizations as well.

Strategies Identified from the Survey and Workshop

Although the national TSMO survey and NCHRP 20-07 Task 365 workshop both revealed a need for peer exchange and information sharing among agencies preparing TSMO program plans, those two activities also captured several agencies experiences and best practices regarding two topics that are central to the Unified TSMO Program Plan Framework and the success of the resultant plan: outreach and funding. The findings from the survey and workshop with respect to these two topics are summarized below.

Outreach Strategies and Guidance

Workshop findings indicated that the most effective methods for TSMO outreach and advocacy employ concrete examples and quantitative results, often building upon recent events in the local media to further motivate the conversation. Instead of positioning TSMO as another entrant into the competitive and crowded arena for limited funds, it should be characterized as a set of strategies that complement other projects and improvements and can be effectively deployed alongside other types of improvements in many situations. TSMO advocates also should be prepared to provide references and supporting documentation, while ensuring that the references provided are concise and cogent.

In addition to these general conversation guidelines for TSMO outreach, the following list proposes several points to highlight regarding the cost effectiveness, efficient use of resources, and other common advantages of TSMO strategies compared to more traditional types of transportation improvements.

- TSMO projects typically cost much less than capital projects and have higher benefit-cost ratios.
- TSMO strategies are well suited to address nonrecurring congestion, which accounts for the majority of congestion in most urban areas.
- TSMO strategies can be built up gradually over time rather than requiring a full-scale initial investment.
- TSMO strategies can generally be implemented and deployed in much shorter timeframes than traditional capital strategies, so benefits are realized in the short term.
- TSMO strategies already are aligned with many common agency goals and priorities (e.g., enhancing safety), and are complementary to existing initiatives (e.g., incident management).

Funding Strategies and Guidance

Financial support was a second subject that was brought up as an area where early guidance and resources are needed to support TSMO program plan efforts. At the NCHRP 20-07 Task 365 workshop, some agency experience suggested a budget of approximately \$200,000 to support TSMO program plan development. Through the national survey, respondents that already had started their TSMO program plans identified the following as sources of funds that were being used to support their efforts.

- Formal TSMO line item or identifiable category in the department budget – This is expected to be a more feasible source for agencies where there already is an executive-level or management-level understanding and appreciation of TSMO.
- Projects related to TSMO – This was a common source at agencies where budgets tended to be project-focused.
- Informal arrangements that draw upon several other budget line items – This strategy may provide less structure and funding consistency in the long term, but can prove to be the most practical method at agencies where no single initiative or project has sufficient budget flexibility to support TSMO program plan development independently.

At the NCHRP 20-07 Task 365 workshop, participants shared insights and suggestions for potential external sources of funding to support TSMO program plan development and implementation, which are listed below. Although FHWA does not currently sponsor a dedicated funding program for TSMO program plan development, the FAST Act funding opportunities listed below may be applied for implementation and deployment support.

- FHWA State Planning and Research (SP&R) program funds through MAP 21.
<http://www.fhwa.dot.gov/map21/factsheets/spr.cfm>.
- FHWA Surface Transportation Block Grant Program (FAST Act).
<http://www.fhwa.dot.gov/fastact/factsheets/stbgfs.cfm>.
- FHWA Advanced Transportation and Congestion Management Technologies Deployment element of the FAST Act.
<http://www.fhwa.dot.gov/fastact/factsheets/advtranscongmtfs.cfm>.

Investment in Peer Exchange

As discussed in Chapter 5, peer exchange opportunities can be a highly valuable supporting activity for TSMO program plan development, as they provide agencies with a mechanism for sharing best practices, lessons learned, and other practical advice learned through their own experiences. The following is a list of some suggested materials and resources that were identified by NCHRP 20-07 Task 365 workshop participants as being particularly valuable to have as they embark upon TSMO program plan development efforts of their own. As agencies develop these kinds of materials to support their specific TSMO program planning efforts, the workshop participants encouraged those agencies to make these available to others as well, through peer exchange activities and information exchange platforms.

- Details about quantitative TSMO benefits.
- Insights about best practices for advancing CMM levels.
- Videos or other publicity materials about TSMO, especially if those materials include or feature political leaders or executive-level decision-makers.
- For agencies that rely on consultants for assistance, it would be valuable to share their Scope of Work descriptions for those contracts if possible.
- Meetings regarding plan development/implementation.

Potential Information Exchange Strategies

Web-based meetings, teleconference calls, and in-person exchanges are traditionally used for peer exchange activities, and have all proven to be very effective methods for this purpose. Another complementary idea that was raised during the NCHRP 20-07 Task 365 workshop was that of an on-line web portal. If configured to allow for collaborative editing of content and structure (i.e., designed as a wiki-type web portal), it could function as a virtual library of information and resources related to TSMO and program plan development, including lessons learned, frequently asked (and answered) questions, and publicity outreach materials. The collaborative element of this approach can facilitate the rapid sharing of information and resources on a widespread level, as soon as they become available. Additional considerations for this on-line portal with collaborative contribution capabilities are listed below.

- This strategy would require an agency or person to take ownership of and assume administrative responsibilities for the management and moderation of the web site. This includes moderation and monitoring of content and edits.
- The site will need a web host, though this may be in-house or handled by a third-party hosting service.
- To maximize its utility to target users and beneficiaries, it will be important to publicize the web portal in the places that relevant agency staff already are checking for these kinds of materials (e.g., on the existing TSMO forums, on the FHWA web site, in future (updated) versions of this TSMO Program Plan Framework).

Ongoing Maintenance

This Unified TSMO Program Planning Framework reflects the latest experiences and lessons learned from a wide range of agencies and staff across the country that are involved with TSMO and the development of their own Program Plans. It also incorporates current practice, resources available to date, and the prevailing consensus regarding practical strategies for development and implementation of TSMO. To ensure that this framework continues to be relevant to agencies that are pursuing their own Program Plans, responsive to evolving needs at these agencies, and inclusive of the latest available resources and technologies, it will be crucial to take steps to ensure that this framework is periodically revisited and updated as appropriate. The following are key considerations to inform and guide this update process:

- Ownership of this framework should be clarified, with respect to both supervising agency/organization and specific designated staff persons/positions. Responsibilities associated with this ownership role as well as supportive roles (i.e., additional personnel at either the sponsoring agency/organization or at others) also should be addressed. At minimum, these responsibilities are expected to include the remaining items listed below.
- Information exchange opportunities (web meetings, phone calls, or in-person panel meetings) will need to be organized on a routine basis to explore new developments regarding TSMO program planning, for consideration in an updated version of the Unified TSMO Program Planning Framework.
- New participants to include in these internal framework coordination conversations or events will need to be identified, based on agencies that are actively involved with TSMO and program plan development.
- There will need to be consensus regarding the frequency and extent of regular updates to the Unified TSMO Program Planning Framework.

APPENDIX A

Unified TSMO Program Planning Framework

Framework Component	Anticipated Process Steps <i>(not exhaustive)</i>	Sample TSMO Program Plan Elements
<p>Foundational prerequisites – Laying the groundwork to ensure the TSMO Program Plan development process is properly scoped and supported, including staff support, time and resource commitments, and leadership endorsement. This component involves identifying the core team and ensuring that a feasible management plan is in place to govern the rest of the framework and steps.</p>	<ul style="list-style-type: none"> • Identify TSMO champion(s). • Get commitments from key staff and stakeholders (the full framework and process can be expected to take 1-2 years to fulfill). • Appoint staff or organizations for TSMO Program Plan development responsibility (typically led by operations divisions). • Establish TSMO Program Plan steering committee. • Secure the authority to make changes necessary for the successful design and implementation of the TSMO Program Plan. 	<p>N/A</p>
<p>Mission, Vision, Goals, and Objectives – Establishing the high-level outcomes and setting expectations for the plan, to provide a common, clear direction for all of the components and steps that follow. This component ensures that all stakeholders and partners are like-minded in the understanding of what TSMO and the program plan will do, why it is necessary, and how it will benefit each entity.</p>	<ul style="list-style-type: none"> • Achieve consensus on goals, objectives, scope, schedule, budget • Outreach to Agency Leadership, internal staff, and the public. • Outreach to decision-makers, stakeholders, partners. • Update mission/vision to align with TSMO. • Define TSMO. • Define role of TSMO Program Plan in context of other planning documents. 	<p>Consensus set of goals, objectives, and vision for TSMO.</p> <p>Definition of TSMO (including scope and role, including in the context of other plans).</p>
<p>Performance</p>	<ul style="list-style-type: none"> • Select performance 	<p>Presentation of performance</p>

Framework Component	Anticipated Process Steps <i>(not exhaustive)</i>	Sample TSMO Program Plan Elements
<p>Measurement – Sets context for TSMO and the Program Plan, and gives greater definition to the high-level goal outcomes already established. This component provides tangible descriptions of the current state and goal state.</p>	<p>measures and targets.</p> <ul style="list-style-type: none"> • Assess existing conditions. • Identify performance reporting strategies. • Set priorities. 	<p>targets and priorities.</p> <p>Characterization of current conditions.</p>
<p>Leadership, Organization, and Staffing – Addresses foundational staff structure requirements necessary to support TSMO, thereby enabling the successful implementation of various operational and management strategies as they are adopted. This component ensures that technical and administrative support for TSMO is available at all levels of the organization.</p>	<ul style="list-style-type: none"> • Outreach to Agency Leadership, internal staff. • Identify potential Institutional Improvements. • Identify and implement strategies to promote TSMO culture. • Develop staff retention strategies/programs. • Define overall staffing plan and organization. 	<p>Description of career development plans for TSMO staff.</p> <p>Description of staff organization and reporting structure.</p> <p>Formal statement of endorsement from leadership.</p>
<p>Business Processes and Planning – Performs key integration of TSMO considerations into existing institutional processes, for systematic treatment according to well-defined and documented procedures. Current shortcomings of agency processes regarding TSMO concepts are identified and addressed in this step.</p>	<ul style="list-style-type: none"> • Integrate TSMO into planning processes. • Document Agency TSMO practices, methods. • Develop or adjust business processes to include TSMO. • Identify procedural improvements for data-driven planning. • Integrate TSMO into maintenance planning. 	<p>Discussion of updates to planning processes (including programming, maintenance, project prioritization, etc.) to include TSMO and performance measures.</p> <p>Documentation of agency practices for ensuring proper consideration of TSMO.</p>

Framework Component	Anticipated Process Steps <i>(not exhaustive)</i>	Sample TSMO Program Plan Elements
<p>Resource Positioning and Development – Defines the technical and financial resources available and required to support the high-level general format and needs of TSMO services and projects, such as data systems, infrastructure, and funding sources. For any needs that are not yet met, this component quantifies the gaps between the present and future goal states, and develops implementable strategies to address them.</p>	<ul style="list-style-type: none"> • Outreach to Agency Leadership, internal staff. • Develop data standards/guidelines. • Conduct inventory and gap analysis of agency resources. • Identify and implement funding strategies. • Update and apply ITS architecture. • Identify required resources and investments. • Conduct inventory of data. 	<p>Description of current data resources, standards, and support systems.</p> <p>Documentation of TSMO inventory.</p> <p>Identification of resource gaps and needs.</p> <p>Discussion of current, anticipated future, and potential future funding sources.</p> <p>Presentation of updated ITS Architecture to accommodate needs of TSMO.</p>
<p>Services and Projects – Develops a set of tangible initiatives and solutions in pursuit of the performance targets and goals/vision set earlier, subject to any inflexible practical constraints identified as part of previous framework components. Depending on the outcomes from this framework component, it may be necessary to revisit and update previous components to some degree.</p>	<ul style="list-style-type: none"> • Outreach to stakeholders and partners. • Implement TSMO services/projects. • Identify/prioritize strategies to implement TSMO improvements. 	<p>Describe services and projects to meet TSMO goals and objectives.</p> <p>Map services and projects to resource needs (including funding), performance targets, and relevant staff (including roles).</p> <p>Develop implementation plan (e.g., phases, initial steps, near-term goals) for services and projects.</p>
<p>Roles and Responsibilities – Covers the required staff support elements of the services and projects from the previous component, including considerations of training, policies, and formal documentation. This component applies to staff both internally and at partner agencies/organizations.</p>	<ul style="list-style-type: none"> • Outreach to Stakeholders, Partners, and internal staff. • Define roles, responsibilities, position requirements. • Develop staff training strategies/programs. • Establish MOUs with partners regarding data sharing, resource sharing, incident management, etc. 	<p>Documentation or summaries of MOUs with partner agencies to support various services and projects.</p> <p>Description of staff roles and responsibilities with respect to TSMO business processes, services, and projects.</p> <p>Description of training program(s) for TSMO staff.</p>

Framework Component	Anticipated Process Steps <i>(not exhaustive)</i>	Sample TSMO Program Plan Elements
<p>Evaluation and Reassessment – Ensures that the services and projects are effective at realizing progress toward the goals and targets established previously, and captures mechanisms and methods for ongoing monitoring and continual improvement of TSMO and the Program Plan.</p>	<ul style="list-style-type: none"> • Assess existing conditions. • Collect postperformance metrics. • Conduct follow-up CMM workshop. • Outreach to decision-makers, stakeholders, partners, public. • Establish reporting requirements and procedures. 	<p>Plan for ongoing performance measurement and reporting.</p> <p>Discussion of schedule or trigger for next CMM evaluation.</p> <p>Schedule and staff responsibilities for updating TSMO Program Plan.</p>

APPENDIX B

Survey Questions

Initial Questions: The following questions (question 1 through question 3) were posed to all respondents in order to collect basic information and to sort respondents into the “Yes Group” and the “No Group” to allow for more tailored questions.

1. Please fill in the following information:

Name: _____
 Agency or organization: _____
 Title or role: _____
 Email: _____
 Phone: _____

2. Are you the lead for TSMO efforts at your agency?

- Yes
 No, the lead for TSMO efforts is: _____

3. Does your agency have a TSMO plan?

- Yes, we have a TSMO plan and are in the process of implementing it.
 Yes, we currently are developing a TSMO plan or intend to begin the TSMO planning process soon.
 No, we do not have a TSMO plan, or creating a TSMO plan is a longer-term goal.

Yes Group: If respondents selected “Yes, we have a TSMO plan and are in the process of implementing it” or “Yes, we are currently developing a TSMO plan or intend to begin the TSMO planning process soon” they became part of the Yes Group, and received the following set of questions (question 4 through question 31) tailored to agencies that were either implementing or developing TSMO program plans.

4. What is the geographic scope of your TSMO planning?

- Statewide
 Statewide with some focus on urban areas
 Regional
 Multiple plans – both statewide and some regions

5. When did/will your agency start an official TSMO planning process?

Month: _____
 Year: _____

6. About how many months did the formal process of developing/documenting your TSMO plan take? (Or how long is it expected to take?) _____

7. Did/will your agency produce a formal document for its TSMO plan?

- Yes
- No

7a. What was/will be the official completion date of this formal document? If you are not sure, please check N/A.

- Month, Year: _____
- N/A

Is this formal document available to others?

- Yes, available on our web site.
- Yes, available on request.
- Yes, limited availability on a case by case basis.
- No, we are not sharing the document.
- It will become available to others in the future (Please provide an approximate date if you have one).

7b. What is the form, or expected form, of this formal document? _____

8. Does the mission/vision statement of your overall agency specifically include TSMO goals?

- Yes, the mission/vision statement highlights or makes specific reference to TSMO goals.
- Yes, but the mission/vision statement only indirectly or vaguely references TSMO goals (e.g., including the word “operations” in phrases such as “plan, build, maintain, and operate”).
- No, the mission/vision statement does not specifically include TSMO goals.
- No, but we have a separate TSMO mission/vision statement.
- Other (Please provide any additional details you can below). _____

9. Does your agency have a clear set of TSMO goals, objectives, and performance measures that are aligned with the agency’s larger mission?

- Yes.
- Not at this time.
- No, but we are working to establish this.

10. In your opinion, what has been your agency’s primary motivation for developing a TSMO plan?

Please check all that apply.

- To streamline existing TSMO activities that were being executed inefficiently.
- To more cost effectively address congestion.
- To better integrate with other agency activities.
- To secure dedicated funding for essential TSMO activities and growth.
- To take advantage of opportunities to advance our agency.
- To streamline agency project planning and programming.
- To ensure that our agency is prepared to take advantage of emerging technologies.
- Other (Please provide any additional details you can below). _____

11. In developing the TSMO plan, what division within the agency has championed the effort? If you would like to provide us with additional details, please do so in the space following each answer.

- Our plan leans more towards the planning division of the agency. _____
- Our plan leans for towards the operations division of the agency. _____

Our plan is mostly 50/50 with planning and operations being involved equally.

Other (Please provide any additional details you can below). _____

12. In your opinion, has the progress of TSMO activities within your agency been largely due to an influential, internal champion(s)?

Yes, a senior-level/executive champion.

Yes, a midlevel manager champion.

Yes, a group of champions.

No, the progress of TSMO activities has been driven by widespread consensus that TSMO is key to the future of transportation in our state or region.

Other (Please provide any additional details you can below). _____

13. In your opinion, are TSMO leadership and organization responsibilities – and corresponding authority – well defined in the agency?

Yes

Not at this time.

No, but we are working to establish this.

14. Is there a person who has more than 50 percent of their time in the duties and responsibilities of their job description dedicated to TSMO? If you would like to provide us with additional details, please do so in the space following each answer.

Yes, the following position(s) focus primarily on TSMO: _____

No _____

15. What has been your agency's approach to TSMO planning?

We are working to integrate TSMO planning into the ongoing long-range transportation planning process.

We are working to develop a separate process for TSMO planning (deployment planning).

We are using both of these approaches simultaneously.

We are taking a different approach (Please provide any additional details you can below).

16. NCHRP Project 20-07(345) developed the document Program Planning and Development for Transportation System Management and Operations in State Departments of Transportation that provided a potential a framework for TSMO Program Plans. From your perspective, how has your agency used this framework?

We are strictly following the 20-7(345) framework.

We are mostly following the 20-7(345) framework.

We are doing our own thing tailored to specific interested (incident management, congestion, etc.).

We are doing our own thing tailored closer to the CMM dimensions.

Other (Please provide any additional details you can below). _____

17. A range of possible components in a TSMO plan are listed below. Please indicate your agency's perspective on each component in terms of whether your agency has included the component and how important the component is to your agency's TSMO plan.

Inclusion and Important of TSMO Program Plan Elements
--

TSMO Program Plan Elements	Did not include	Included but view as not very important	Included and view as somewhat important	Included and view as very important
Mission/vision statement				
Defined goals				
Defined objectives				
Business case				
Organizational roles and responsibilities				
Agency reorganization				
Existing conditions – situational analysis				
CMM dimension discussion				
CMM defined action items				
Alternative analysis				
Resource requirements				
Stakeholder roles and responsibilities				
Staffing, job descriptions, career trajectories, succession plan				
TSMO investment plan (timeframes, short- and long-term)				
Implementation plan				
Performance measures				
Systems engineering standards and processes				
Systems engineering standards and processes				
Project development processes				
Case studies or peer experiences				
Plan maintenance				
Other (Please fill in below).				

18. Has your agency developed a TSMO Business Case separate from its TSMO Plan (as a stand-alone document)? If you would like to provide us with additional details, please do so in the space following each answer.

- Yes _____
- No _____

19. What arguments have you found most effective or influential when it comes to making the business case for TSMO? Please check all that apply.

- TSMO projects typically cost a fraction of what capital projects cost and have higher benefit-cost ratios.
- TSMO strategies are particularly well suited to address nonrecurring congestion, which accounts for the majority of congestion in most urban areas.
- TSMO strategies are implemented quickly, so benefits are realized in the short term.
- Other (Please provide any additional details you can below). _____

20. Did your agency receive assistance (funding) from the Second Strategic Highway Research Program (SHRP 2) to assist its TSMO planning process?

- Yes
- No
- No, but we received funding from another source (Please enter the source below).

21. Has your agency hosted or participated in a CMM workshop led by FHWA and AASHTO?

- Yes
- No
- No, but we are planning to/interested in hosting one in the future.

21a. In your opinion, which CMM dimensions has your agency focused on the most in its TSMO planning? Please check all that apply. If you would like to provide us with additional details, please do so in the space following each dimension.

- Business processes _____
- Systems and technology _____
- Performance measurement _____
- Agency Culture _____
- Organization and staffing _____
- Collaboration _____

In your opinion, are there any particular CMM dimensions that your agency has struggled to address? Please check all that apply. If you would like to provide us with additional details, please do so in the space following each dimension.

- Business processes _____
- Systems and technology _____
- Performance measurement _____
- Agency Culture _____
- Organization and staffing _____
- Collaboration _____

22. What have been the key resources used by your agency in the development of its TSMO plan? Please check all that apply.

- Existing resources and relationships from TMCs.
- Existing resources and relationships with the agency planning division.
- Existing resources and relationships with the agency operations division.
- State or agency IT department resources.
- FHWA resources, such as CMM workshops, NOCoE.
- Stakeholder resources (outside of the agency).

Other (Please provide any additional details you can below). _____

23. Are there any resources that your agency has not had that would be particularly beneficial to the TSMO planning process? Please check all that apply.

- Best practices from successful TSMO plans elsewhere.
- Additional CMM workshops.
- Additional information related to the CMM dimensions.
- Additional information on TSMO strategies.
- Additional information on outreach techniques.
- Assistance in developing business cases, or in working with legislature.
- Other (Please provide any additional details you can below). _____

24. What is your agency's current or planned approach to budgeting and accounting for TSMO?

- We have a TSMO line item or identifiable category in the budget.
- We generally rely on informal arrangements to support TSMO from multiple line items.
- Managers tend to package TSMO investments into related projects in order to compete for funding as part of a project-focused budget process.
- Other (Please provide any additional details you can below). _____

25. Has your agency used a consultant to help produce the TSMO plan? If you would like to provide us with any additional information, please do so in the space following each answer.

- Yes _____
- No, our TSMO plan has been produced in-house. _____

26. Has your agency engaged other regional agencies (e.g., highway patrol, emergency management agencies, or public safety agencies) in the development of its TSMO plan?

- Yes (Please fill in the names of other agencies engaged below). _____
- We have engaged other agencies to the extent that we usually coordinate with them (Please fill in the names of these agencies below). _____
- No we have not directly engaged other regional agencies.

27. Has your agency engaged stakeholders and other partners in generating the TSMO plan? If you would like to provide us with any additional information, please do so in the space following each answer.

- Yes (please list key stakeholders). _____
- No, we have produced our TSMO plan internally. _____

28. Do you find that policy-makers are generally supportive of advancing and institutionalizing TSMO activities in your state or region?

- Yes, policy-makers have been supportive or receptive.
- Policy-makers have been neutral or do not understand the benefits of TSMO over other transportation activities.
- No, winning support from policy-makers has been a challenge.
- Other (Please provide any additional details you can below.). _____

29. In your opinion, where has your agency encountered challenges in the development of its TSMO plan? Please check all that apply.

- Crafting the TSMO plan.

- Securing the authority make important changes as part of the TSMO plan – within our Agency’s culture.
- Securing the authority make important changes as part of the TSMO plan – due to limited funding and/or funding sources.
- Implementation strategies within TSMO plan.
- Gaining acceptance for the TSMO plan.
- Other (Please provide any additional details you can below). _____

30. What TSMO areas would you like to have peer success stories to learn from?

31. Does your agency have a TSMO planning success story that you would like to share to help other agencies developing TSMO plans? If yes, we will follow-up with a phone call to respondents to collect success stories.

- Yes.
- Not at this time.

No Group: If respondents selected “No, we do not have a TSMO plan, or creating a TSMO plan is a longer-term goal” they became part of the No Group, and received the following set of questions (question 4 through question 11) tailored to agencies that were not currently developing TSMO program plans.

4. In your opinion, for what reasons does your agency not have a TSMO plan, or have creating a TSMO plan as a longer-term goal? Please check all that apply.

- We have assessed that our resources will be better spent on other initiatives.
- We are holding off on TSMO planning until we can allocate the needed resources.
- We are holding off on TSMO planning until we can first address other operations issues.
- The benefits of TSMO planning for our agency, region, or state are not evident at this time.
- We currently are more focused on maintaining existing initiatives with limited resources and funding.
- We do not have any particular champions of TSMO planning or do not have any champions in the position to push for a new initiative.
- There is some opposition to TSMO planning in our local legislature or in our agency.
- Other (Please provide any additional details you can below). _____

5. Do you believe any of the following would prompt your agency to pursue TSMO planning sooner or more actively? Please check all that apply.

- Demonstrations of the benefits of TSMO planning in other states and regions.
- More specific or up-to-date best practices for creating an effective TSMO plan.
- Opportunities to obtain funding or other resource to conduct TSMO planning.
- Opportunities for staff to learn more about TSMO planning (e.g., trainings and webinars).
- Other (Please provide any additional details you can below). _____

6. How would you personally describe your agency’s level of attention to the emerging practice of TSMO planning?

- Senior officials, operations managers, and operations staff are generally well aware of the emerging practice of TSMO planning in U.S. states and regions.
- Operations managers and staff are generally well aware of the emerging practice of TSMO planning in U.S. states and regions.

- A few individuals have been tracking national trends in TSMO planning and/or discussing the concept of TSMO planning.
- The concept of TSMO planning is generally not on the agency's radar.
- Other (Please provide any additional details you can below). _____
7. Do you find that policy-makers are generally supportive of advancing and institutionalizing TSMO activities in your state or region?
- Yes, policy-makers have been supportive or receptive.
- Policy-makers have been neutral or do not understand the benefits of TSMO over other transportation activities.
- No, winning support from policy-makers has been a challenge.
- Other (please provide any additional details you can below). _____
8. Does the mission/vision statement of your overall agency specifically include TSMO goals?
- Yes, the mission/vision statement highlights or makes specific reference to TSMO goals.
- Yes, but the mission/vision statement only indirectly or vaguely references TSMO goals (e.g., including the word "operations" in phrases such as "plan, build, maintain, and operate").
- No, the mission/vision statement does not specifically include TSMO goals.
- No, but we have a separate TSMO mission/vision statement.
- Other (please provide any additional details you can below). _____
9. In your opinion, are TSMO leadership and organization responsibilities – and corresponding authority – well defined in the agency?
- Yes.
- Not at this time.
- No, but we are working to establish this.
10. Has your agency hosted or participated in a CMM workshop led by FHWA and AASHTO?
- Yes.
- No.
- No, but we are planning to/interested in hosting one in the future.
11. Would you like someone to provide you with further information or resources on planning a CMM workshop?
- Yes, please reach out to the email address or phone number I provided at the beginning of the survey.
- Yes, please reach out to this email address or phone number: _____
- No, not at this time.

APPENDIX C

Workshop Meeting Minutes

Day 1 Morning (Thursday, February 25, 2016)

FHWA Update on TSMO Program Planning Initiatives

- TSMO plans are inspired by State Safety Plans, which are well documented and have associated funding initiatives.
 - Safety has a clear goal: zero deaths. TSMO needs a similar unified goal.
 - FHWA does not anticipate requiring a set structure for TSMO plans, as had been done previously for State Highway Safety Plans.
- ITS architectures could be used to advance TSMO, but they are not widely understood.
- Challenges facing TSMO advancement:
 - The public generally appreciates maintenance needs more than operations needs.
 - Benefits are accrued indirectly; travel time savings do not translate directly into monetary savings, but improved pavement often does.
 - Some of FHWA's funding programs and processes do not currently facilitate inclusion of TSMO.
- Pavement coalitions can provide resistance to investment in TSMO; on the contrary, communications companies can often function as proponents.
- The Transportation Performance Management framework will incorporate CMM concepts, including data management.

Elevator Speech Activity

Summary of the group discussion following the elevator speech exercise:

- Emphasized aspects of TSMO:
 - Benefits:
 - Cost-effective, lower relative cost, and opportunities to fund more projects.
 - Alignment with existing state goals and initiatives (e.g., stimulating economy, improving safety).
 - Multimodal, multiagency approach.
 - “A new lane is expensive and offers no benefit at uncongested times.”
 - TSMO is often more practical than capital improvements, and faster to accomplish.
 - A fresh solution to congestion that provides most benefit when it is needed most (e.g., during peak periods).
 - The agency already is doing many TSMO things (e.g., TIM), which motivates the need for an overall plan.
 - Communication strategies:
 - Keep it short; use a couple sentences now to spark interest and go into more detail in a later conversation, once interest has been established.

- Provide tangible examples (e.g., recent news events) with specifics and statistics.
- Compare to the outcomes associated with capital projects.
- Do not position TSMO as a competitor to capital projects. Instead, characterize it as complementary to existing projects and programs.
 - Highlight what TSMO is well-positioned to do, that other strategies cannot (e.g., coordinating efforts along an entire corridor).
 - Explain in simple terms why TSMO works, what it does.
 - Avoid the term “TSMO” and other jargon. Explain concepts in understandable terms or by using examples.
 - Avoid offering lengthy materials for reference, which places a reading/time burden on the target audience.
- Discussion: what should be included in the program plan?
 - Business case (e.g., cost effectiveness, economic benefits compared to capital projects) with tangible examples and specifics.
- Show how it aligns with current state goals (e.g., safety).
 - Explain TSMO, including its multimodal nature and unique capabilities.

Presentation of Survey Results

Summary of the group discussion during the presentation of the results of the national survey on TSMO program planning.

- Reorganization can be a questionable item to include in a TSMO plan, as it can be the determining factor between a feasible and infeasible plan.
 - Shuffling existing positions from other divisions can be easier than adding new ones.
 - Alternatively, some agencies have created new processes in place of reorganizing staff.
 - Generally, corridor managers fulfill some TSMO roles (i.e., coordination with local agencies).
- Agencies that lacked TSMO champions might have been more likely to prioritize the need for a TSMO Business Case to compensate.
- This survey and its results can be relevant material for agencies when presenting to leadership and decision-makers about TSMO.
- Comments from the group
 - In some instances, the question left the respondents unclear as to what was being asked. For example, "is there a person who has more than 50 percent of their time, in the duties and responsibilities of their job description, dedicated to TSMO?" – does the person need to be performing a strict definition of TSMO, or simply a function that TSMO represents?
 - Surveying people who are not normally involved with TSMO would provide insight into the perceived value of a TSMO plan (and accompanying reasons).

Day 1 Afternoon

Survey Results Discussion

The summary below captures the group’s insights for TSMO program planning, which were sparked by the presentation of survey results.

- Should TSMO be a requirement, or be left as guidance?

- The State Highway Safety Plans and ITS Architectures were required, but this resulted in documents that were sometimes not that useful (i.e., written just to satisfy the requirements).
- Incentives would be a preferred approach over requirements.
- States might be motivated by examples of how other states have used their TSMO plans, and what the benefits were.
- TSMO funding programs need to accompany TSMO plans for those plans to be feasible/practical (since implementation requires money).
- Standing committees can be used to take ownership of TSMO plans (e.g., monitoring progress, keeping them updated).
- Staffing
 - Recommending a significant reorganization within the agency may make an otherwise solid TSMO plan infeasible for some agencies.
 - Specific staffing needs may be easier to identify toward the end of TSMO plan development, but high-level TSMO staff organization and reporting structure can be valuable to outline toward the beginning.
 - It may help to indicate the number of positions required, even if it is not known where those positions will come from. Be prepared to justify the positions with a clear and compelling case.
- If resistance is met for new positions, one strategy would be to compare the value of an additional staff position in TSMO to an additional (or even existing) staff position in another area.
 - Establishing “TSMO Liaisons” in other parts of the organization could help establish TSMO staff without creating new positions.
 - When structuring a TSMO group, avoid placing too much dependence on any particular position, so that a single staffing departure will not disrupt the group/culture.
 - Other elements of staffing to address are training and retention.
- Bottom-up or top-down approach?
 - Top-Down
- TSMO momentum can be accomplished by aligning it with existing initiatives with common or compatible goals/activities.
 - » One strategy for integrating TSMO into project development plans is to require TSMO scenarios as the default comparison baseline.
 - » Upper-management TSMO initiatives have been very valuable for TSMO planning at some agencies.
- Support from agency leadership is important, as these are the people who need to approve of the plan. Including upper management in early TSMO plan development conversations can help boost support.
- Surveys of upper management regarding their priorities and concerns could naturally lead to useful quotes (i.e., in support of TSMO) for inclusion in the TSMO plan, and also provide guidance regarding desirable content.
 - Bottom-up
- Incremental changes may not go far enough; starting from scratch provides a less constrained approach.
- Support from field positions/staff is important, as these are the people who will be implementing the plan.
 - » Seeking input from these staffing levels may strengthen a TSMO plan and boost its support base.
- TIP considerations
 - It is sometimes challenging to make the business case for TSMO when capital projects do not include maintenance/operations funding requirements.

- To address this, TIP projects could be required to include maintenance and operations funding. This also prevents maintenance and operations staffs from becoming inappropriately burdened by new capital projects.
- TSMO Planning horizon
 - Consensus was that three to five years was a reasonable TSMO planning horizon, due to the pace of technology and implementation.
 - Having a short-term, medium-term, and long-term plan (e.g., four years each) would be another TSMO planning strategy.
 - Technology changes rapidly, which creates a planning problem for agencies: having too short a horizon makes it difficult to plan for broader paradigm shifts and changes, but a longer planning horizon may not take advantage of new technologies in the future as they become available.
- Funding
 - It would be valuable to have a TSMO-oriented resource similar to the AASHTO paper, “Making the Case for Transportation Investment and Revenue.”
 - Agencies are not consistent in their use of CMAQ for TSMO.
 - A TSMO program plan can help prepare projects so that they are ready when funding opportunities arise.
 - If an agency already has a Technology Plan, it could function as an effective starting point for a TSMO plan.
- Alternatively, a TSMO plan could be presented as a kind of Technology Plan when seeking funding to develop it.
 - Obtaining management support for TSMO can lead to future funding support. This strategy also has the benefit of being more reliable in the long term; individual funding sources may come and go, but new ones can be sought if the program has management support.
- Other strategies for promoting TSMO
 - Incident management can be a good way to show the value of TSMO.
 - Agencies may boost support for TSMO by referencing success stories from other agencies’ TSMO projects and programs.
- Concerns
 - Current agency processes are optimized for capital projects, but are poorly suited for the pace of technology and TSMO. New processes will likely be needed for TSMO strategies and programs.
 - Should keep in mind that some agencies have TSMO programs that are still in their infancy.
 - It can be challenging to obtain support for developing TSMO plans, as support more naturally arises only when plans are (nearly) complete.
 - A poorly designed TSMO plan may have the unintended effect of making people less enthusiastic about TSMO’s potential.
 - Small agencies may struggle to convince partner agencies to become invested in the TSMO planning process.
- Other Plan Considerations
 - Specify a schedule for regular updates; it will reinforce the idea that the plan is a living document.
 - Define the target audience for each TSMO plan before writing it (e.g., program plan is for industry, strategic plan is for anyone).
 - Information is highly valuable, but can sometimes be challenging to extract from mountains of data.
 - Prioritizing TSMO components can be done by asking operations staff to list, in order, which functions they would stop funding first and last.

Framework Development Groups

- Presentations by the groups – Speaking points
 - Group 1: MPO/regional group
- Some stakeholders may not be supportive (e.g., “lizards”).
- The specific items may differ by agency (e.g., specific strategies), but the process would be the same (e.g., same approach).
- The steps include a feedback loop.
 - Group 2: Statewide group
- The first step involves identifying relevant people/agencies and setting expectations/scope. The second step involves outreach (e.g., public, leadership). The third step defines the foundational parts of the plan: mission, vision, goals, and objectives.
 - Group 3: Statewide group
- Step 1 includes strategic planning, and is used to justify needs and set priorities.
- Step 2 (Culture) is needed before the proper partner agencies can be identified.
- The steps end with implementation, followed by a new cycle (i.e., repeating to update the plan).
 - Group 4: Statewide group
- Literature Review is a prerequisite step.
- Performance Metrics warranted its own step, but culture did not (it will instead be established in other steps).
- Clarifications:
 - » Collaboration includes outreach to decision-makers
 - General Comments
- During the presentation of Group 1’s framework, the entire group expressed significant support for the evaluation/reassessment step, and the feedback loop concept. Groups that did not explicitly include this in their framework indicated that this step should be added.
- The key activities listed by each group also could be used to provide insight into the items that a TSMO plan table of contents might include. It would be helpful if the framework provided guidance regarding TSMO program plan structure.
- The framework should be approachable and applicable to a broad range of agencies, and not just those with more advanced TSMO programs and capabilities already.
- Before developing a TSMO plan, its scope and audience should be addressed: is it for a geographic area (e.g., the State), or for a specific agency (e.g., the DOT)? In most cases, it will be for a geographic region, but the framework should discuss the differences that arise if the Plan is instead for a single agency.

Day 2 Morning (Friday, February 26, 2016)

Synthesis of Day 1 Discussions and Activities

- Analysis and Synthesis regarding specific TSMO Plan steps/sections – based on the consolidated draft framework.
 - Definitions:
- Steps: These could be items to include in the TSMO plan itself (i.e., items for the Table of Contents).
- Processes: These are items that are a required part of developing the TSMO plan, but do not need to be discussed at length in the plan itself (e.g., development and engagement).
 - Collaboration, communication, and outreach

- Collaboration is more than outreach and communication: it also defines relationships, roles, and responsibilities between stakeholders. A list of potential stakeholders could be helpful (even TSMO opponents).
- Collaboration is required to create the plan (e.g., identifying appropriate partners to contribute to plan development), but the plan also is required to clarify collaboration procedures.
- As a section.
 - » Roles and responsibilities could be discussed in the Staffing section.
 - » Even if not included as an explicit section, collaboration and partnerships are expected to have a central role for the TSMO plan.
 - » Outreach/stakeholders could be covered in the Implementation section.
 - » Collaboration could be discussed by topic, such as in the data systems section (i.e., for data sharing).
 - Staffing
- Could be treated as a gaps/needs analysis, where desired and available functions/skills are compared.
- Could be easier to discuss desired staff functions/skills than to outline specific numbers of positions (especially for MPOs).
- This section also could discuss issues/points from the CMM dimension, “organization and staffing” (e.g., leadership).
 - Implementation
- Includes marketing considerations for the TSMO plan.
- Outcomes in three possible forms: TSMO projects, TSMO programs, and TSMO policies.
- This section likely requires other sections to be complete first (e.g., collaboration, business processes, staffing).
 - Integration of CMM dimensions
- Conducting a CMM workshop could be an early process step in the development of a TSMO plan, and could be repeated at regular intervals as specified in the plan, as a gauge of progress.
- CMM priority actions could be added to the Implementation section.
 - Products and Services (parallel to three CMM dimensions)
- Culture
 - » Perhaps not necessary as its own dedicated section.
 - » Could be included in the Implementation section, or in an Outreach/Education section.
- Business Processes
 - » Could be included as a step, but not necessarily as a dedicated section.
 - » Could be included in the Funding or Motivation sections.
- Systems and Technology
 - » Could be included in the Implementation section, which would be defined to include implementation of services and projects.

Discussion of Resources

- Documents
 - “Advancing TSMO through Scenario Planning” – available on FHWA web site.
 - “Planning for TSMO within Corridors” – Coming soon, will address specific considerations related to agency size (e.g., particularly small agencies).
 - “TSMO Program Planning Primer” – Expected in June 2016.
 - An asset management document on TSMO is available from NCHRP.
 - “Planning through Resilience for Operations” – Coming soon.
- Events

- Upcoming events with TSMO relevance: STSMO, RTSMO, and ITE meeting in August. These are good opportunities for presenting the work from this NCHRP workshop as well.
- Workshop: Implementation of TSMO – March 24. The Resource Center is helping organize this workshop.
- From agencies
 - It would be valuable to share any details about TSMO benefits they have realized, or insights about best practices for advancing CMM levels.
 - If agencies have videos or other publicity materials about TSMO, they are encouraged to share them.
- For agencies that rely on consultants for assistance, it would be valuable to share their Scope of Work descriptions for those contracts if possible.
 - Peer-to-peer meetings regarding plan development/implementation.
- Other potential resources
 - A collaborative TSMO wiki could be an effective method for sharing lessons learned and Q&A than the current TSMO message boards.
- However, an agency or person will need to take ownership of it, to guide and direct it as needed. To maximize its utility, the wiki will need to be publicized in locations that planners/staff already are naturally checking.
 - A virtual version of the collaborative process boards that were used for the workshop group activity would be valuable to have.
 - A video of agency and political leaders discussing the benefits and value of TSMO would be valuable as well.
- Resource needs
 - Funding the TSMO plan development: Past agency experience indicates that a reasonable budget is about \$200,000.
- SP&R funds are a possibility; SHRP 2 funds have been used.
- MPOs may be able to use STP&M funds.
- FHWA currently has no specific source for TSMO plan development.
- The FAST Act (Advanced Transportation Technology Deployment) could be used for TSMO deployment, but not plan development. MPOs may struggle to complete for these funds. Awards will be made in September 2016.
 - TSMO plan incentives
- One possible incentive would be to grant agencies extra flexibility regarding other FHWA requirements.
 - Agencies expressed interest in a training program for TSMO planning.
 - Although the TSMO plan itself can be used as a valuable outreach and publicity tool, other resources for outreach/publicity are needed while the plan is being developed, for initial education and for establishing support.
 - Guidelines for Implementation are needed. This would include integration of the plan into other aspects of the organization and its processes, and into other programs (e.g., TIP, STIP, Strategic Safety Plan).