SHRP2 L01 PRODUCT CLOSE OUT AND SUMMARY REPORT

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Overview of Report

This is the Close Out and Summary Report for the Second Strategic Highway Research Program (SHRP2) L01 effort to develop a primer and conduct workshops on "Improving Business Processes for More Effective Transportation Systems Management and Operations" (TSMO). This Summary Report includes the following sections:

- **Background** – Definitions of key terms and a brief summary of previous activities and SHRP2 products leading up to this effort.

- **E-tool** – Brief overview of the E-tool for Business Processes to Improve Travel Time Reliability, as developed under SHRP2 L34.

- **Primer** – Brief overview of the Primer developed as part of this TSMO effort.

- **Workshops** – Summary of the four workshops on business processes conducted, including information specific to each site.

- **Recommendations** – Suggestions for improving the workshops and associated material should additional workshops be funded and presented at additional sites.

Background

The term **Business Processes** is defined in several L01 products as follows:

> *"A series of actions or activities that result in a specific or desired outcome to accomplish a specific organizational goal."*

In the context of TSMO, the term refers to activities such as planning, programming, agency project development processes, and those organizational aspects that govern various technical or administrative activities (such as training, human resource management, or agreements).

The workshop slides define Business Processes as a collection of linked tasks that find their end in the delivery of a service to customers. Attributes include the following:

- A set of structured actions that, once completed, will result in a desired outcome to accomplish a specific goal

- Specific activities in a specific sequence, with clearly defined inputs and specific output(s) – structured workflow

- Process that adds value

- Continued focus on re-engineering processes to improve efficiency

A related concept called **Business Process Mapping** is a visual representation of the steps, connections, information flows, and responsibilities involved in a business process from start to finish. Business process mapping provides a concise picture of the sequences of tasks needed to bring a service from genesis to completion, including decision points in the process (with yes or no leading the process in either one of two directions), when the process takes place, why it takes place, and who is involved in the process and responsible for decisions. A good business process map can be validated (that is, represents reality) and can help stakeholders identify where delays exist, where smooth handoffs are not taking place, and what steps may be eliminated so as to improve processes. One example of a business process map (for incident management, as developed for the Dallas area) is shown in Figure 1.
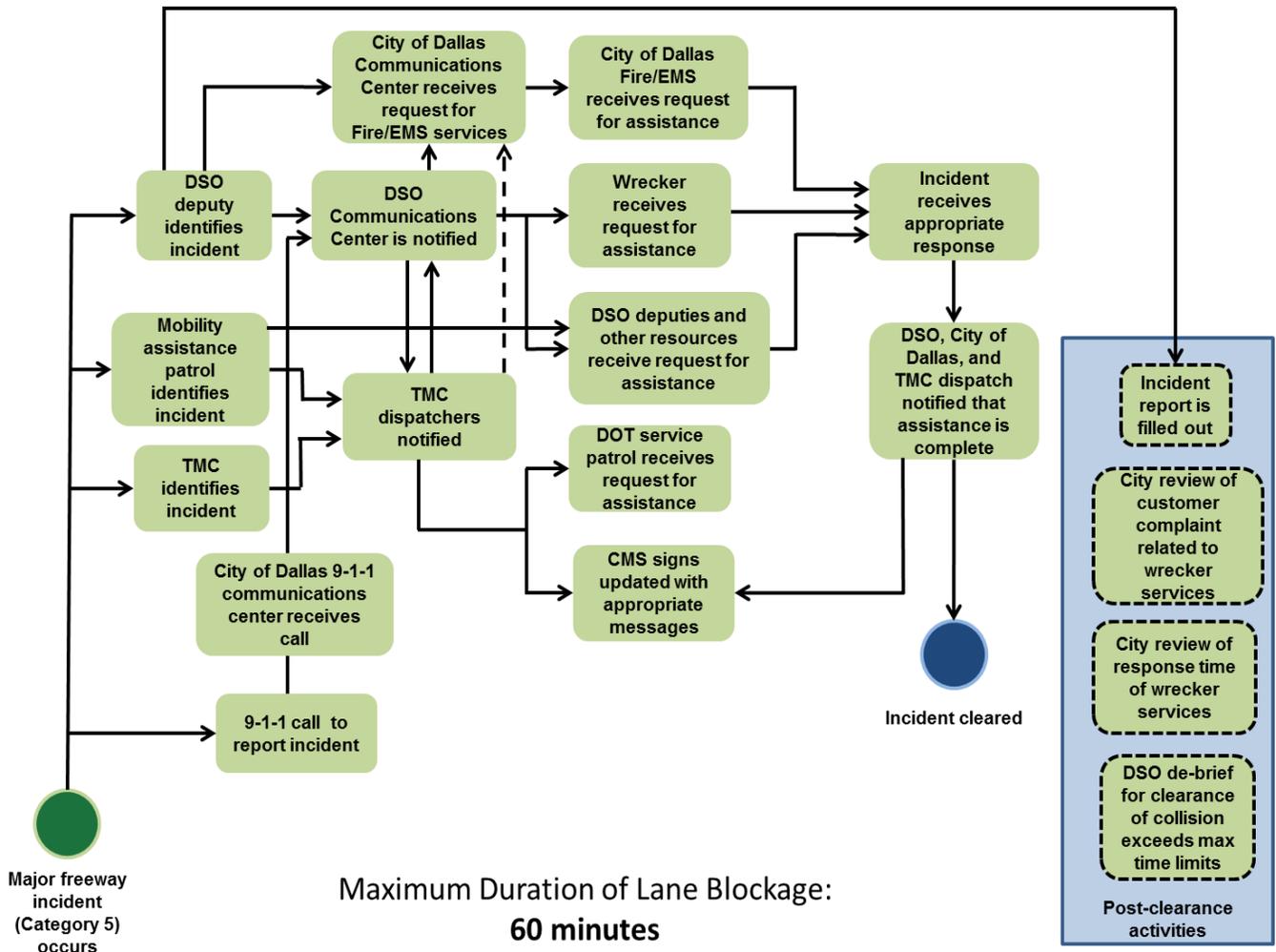

Figure 1. Example of Business Process Mapping

The SHRP2 L01 effort has focused on how business processes can improve TSMO, where TSMO may be defined as "integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system
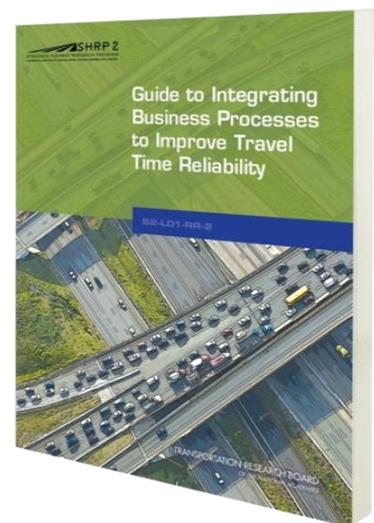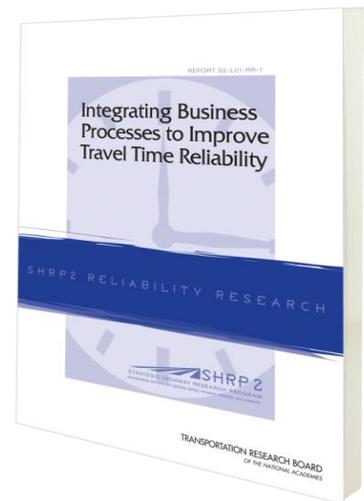
management."[1] Examples of these TSMO strategies include incident management, road weather management, planned special event management, work zone management, and traffic management.

The concept of business processes is not new. The term is used as early as 1776 by the economist Adam Smith, considered by many as the father of capitalism, in an example of a pin factory, identifying what each person does along the assembly line and the sequence of these activities (see inset). Some of the initial SHRP2 work in the reliability area has focused on or otherwise addressed business processes, such as the following:

> **An early business process for a pin factory as defined by Adam Smith**
> "One man draws out the wire, another straights it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head: to make the head requires two or three distinct operations; to put it on is a particular business, to whiten the pins is another ... and the important business of making a pin is, in this manner, divided into about eighteen distinct operations, which in some manufactories are all performed by distinct hands."

- **Integrating Business Processes to Improve Travel Time Reliability Report SS-L01-RR-1 (2011):** This report identifies and documents practices that successfully integrate business processes to improve travel time reliability. The key business processes within the Department of Transportation (DOT) and transportation operations – including incident management, work zone management, planned special event management, road weather management, and traffic control – were identified from ten case studies in the United States and in the United Kingdom. This study found that there were two distinct aspects to process integration that were critical to support reliability-focused operations: process integration at the operations level, and process integration at the institutional or programmatic level.

- **Guide to Integrating Business Processes to Improve Travel Time Reliability SS-L01-RR-2 (2001):** This guide examines the integration of business processes at the operational and programmatic levels. It provides a step-by-step guide for agencies to assess their operational processes and identify opportunities to change or develop new processes. It also discusses business process mapping and the importance of having a consistent method of process modeling to assist in comparing similarities across several dissimilar processes. Business Process Modeling Notation (BPMN) was identified as the most applicable business process modeling approach, and as a viable standard to use. An example of a BPMN business process map (from the report) is provided in Figure 2.

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[1] As defined in *Moving Ahead for Progress in the 21st Century* [MAP-21] (Federal Highway Administration [FHWA], 2012)
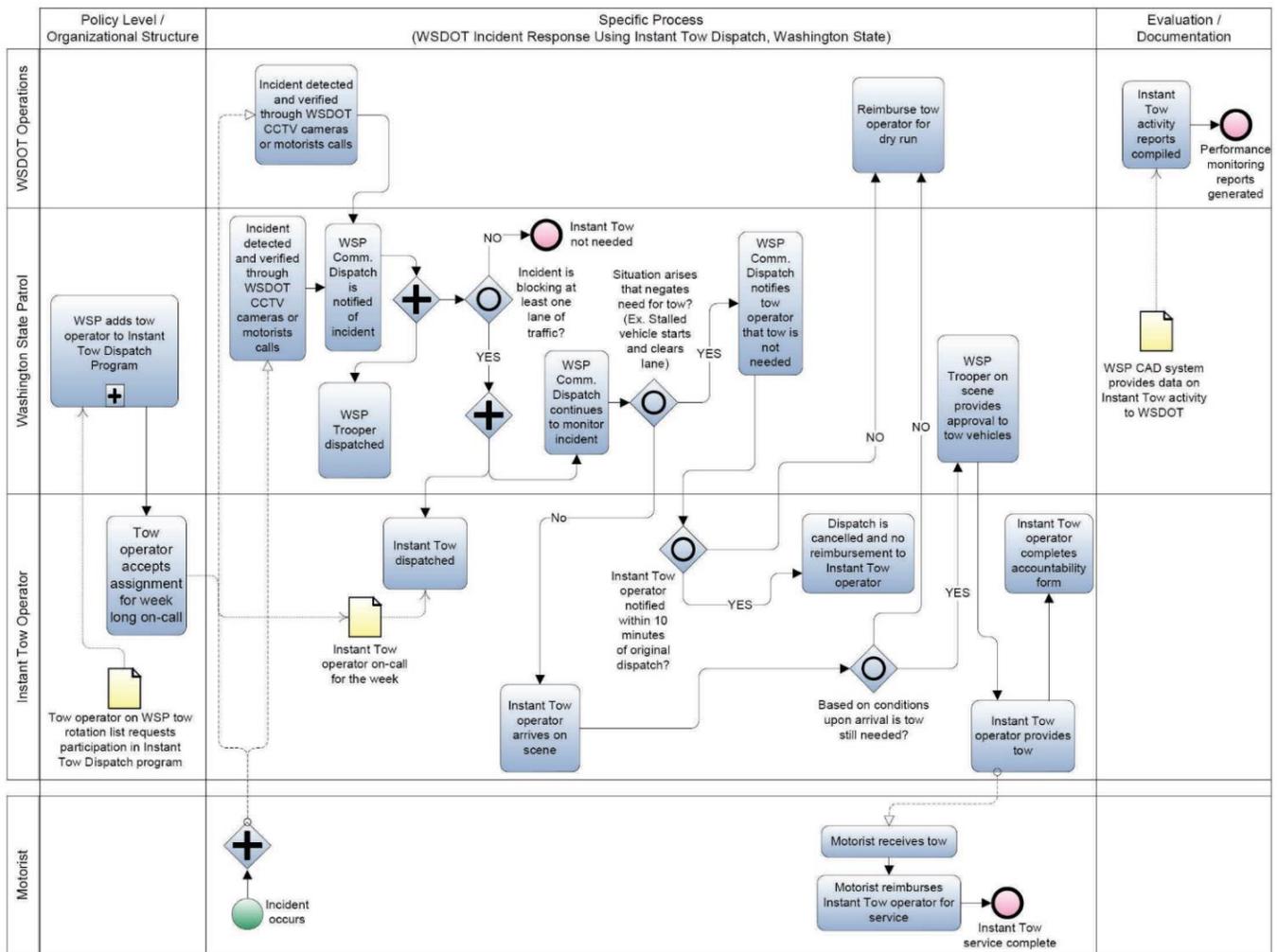
Figure 2. Example of Business Process Mapping Using Business Process Modeling Notation

- **E-tool for Business Processes to Improve Travel Time Reliability (L-34):** This software was developed to assist transportation agencies when evaluating their processes to improve travel time reliability. It is based on the processes and case studies outlined in SS-L01-RR-2. Additional information regarding the E-tool is provided in the next section.

- **Institutional Architectures to Advance Operational Strategies (L06)**: This study resulted in an institutional capability maturity model (CMM) framework that identified all the elements needed to continually improve activities one level at a time for six dimensions: business processes, systems and technology, performance management, culture, organization and workforce, and collaboration. For each of these six dimensions, four levels of maturity were defined, where the term "maturity" is related to the degree of formality and optimization of these processes in support of effective operations. The levels of maturity for the "business processes" dimension are shown in Table 1. Additional information on the CMM framework is provided at http://www.aashtotsmoguidance.org/. Over the past few years, FHWA sponsored numerous CMM workshops, where transportation agencies and regional entities evaluated themselves. Overall,

4

nearly all of the agencies rated themselves between 1 and 2 for the business process dimension – the lowest of any of the six dimensions. [2]

Table 2. Maturity Levels for Business Processes

Level	Capability
1 – Performed	Processes related to TSMO activities ad hoc and unintegrated
2 –Managed	Multiyear statewide TSMO plan and program exists with deficiencies, evaluation, and strategies
3 – Integrated	Programming, budgeting, and project development processes for TSMO standardized and documented
4 – Optimized	Processes streamlined and subject to continuous improvement

- **Business Process Frameworks for Transportation Operations:** To continue the emphasis on capability maturity and to provide program-level guidance, FHWA developed additional capability maturity frameworks (CMFs) that focus on improvement actions for specific TSMO program areas, including traffic incident management (TIM), work zones, planned special event (PSE) management, road weather management, traffic management, and traffic signal management. The frameworks were developed based on a similar structure and approach to the American Association of State Highway and Transportation Officials (AASHTO) TSMO guidance and the associated CMM structure developed for L06 as previously described. These frameworks can be found at https://ops.fhwa.dot.gov/tsmoframeworktool/.

E-tool

The E-tool helps practitioners define and evaluate their current business processes, identify improvements to these business processes – in an iterative manner – to enhance operations, and succinctly capture key action items and generate a summary of the discussions and action items. Users are guided through the seven steps identified in the SHRP2 research as shown in Figure 3. The E-tool was developed by SHRP2 based on the L01 research, and FHWA is available to support groups and individuals wanting to use the tool to assess and improve their TSMO-related business processes. The E-tool includes excerpts and examples from the original L01 research previously described, to help provide context for the different stages of business process analysis, change, and implementation. Populating the E-tool can also help to facilitate and document discussions between stakeholders.

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[2] The term "CMM" is not used in the workshop slides, the logic being that several participants may not have been involved in a CMM workshop and would not be familiar with the term. The concept is shown, but is presented at "assessing TSMO programs".
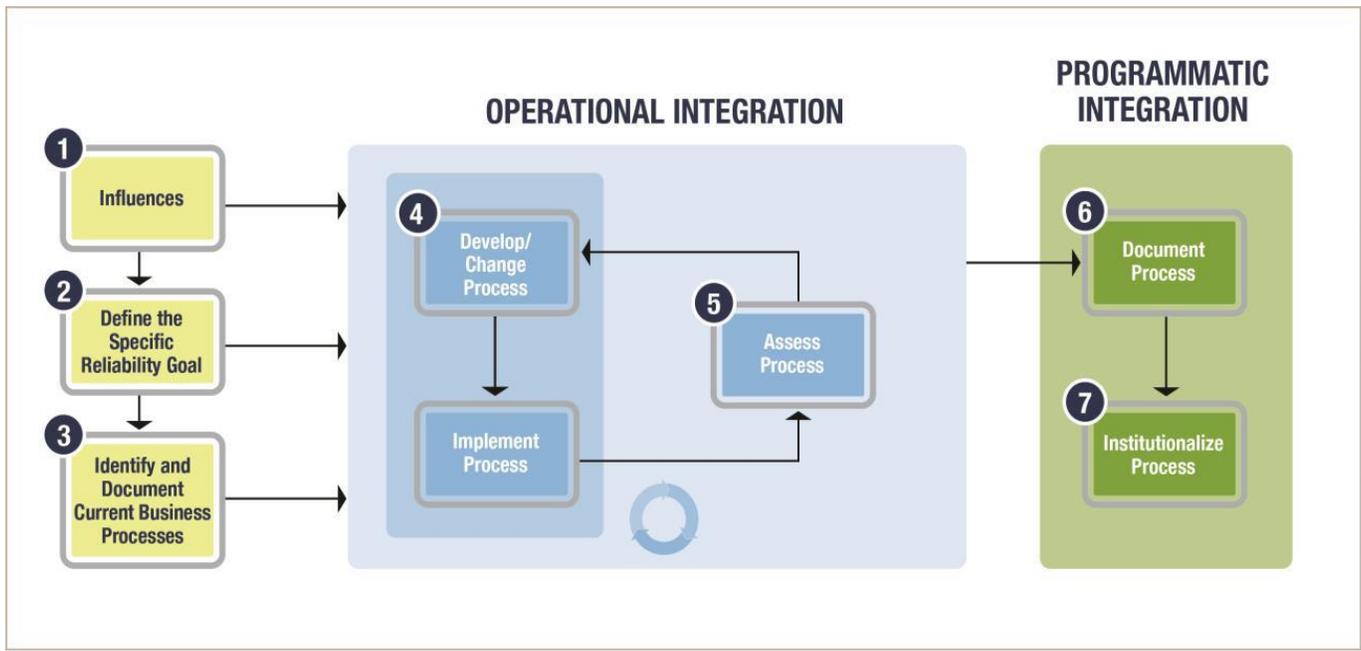
Figure 3. E-tool Steps

The E-tool includes an **orientation model** (that is, background, instructions for use, and introduction to the case studies), and an **application module** for applying the seven steps, preferably in a workshop or other group setting. The steps in the E-tool are summarized as follows:

- **Step 1: Influences.** At some point, it becomes apparent that a business process needs to be improved. The catalyst for action can be top down, event driven, or needs based. Examples of such influences for action are directives from senior management or elected officials, a significant natural disaster that exposes gaps in current agency processes or response plans, or just a recognized need for the improvement.

- **Step 2: Define the Specific Reliability Goal.** The second step is to identify, define and input the reliability (and other operations-oriented) goal or goals that the agency can use to measure the effect of the business process implemented to improve travel time reliability. Such goals help focus agency efforts on the problem at hand regardless of any specific process used to achieve that goal. Goals also assist in the development of benchmarks that an agency can use to determine how well the processes are meeting the identified need.

- **Step 3: Identify and Document Current Business Processes.** This step is important to understand an agency's current business processes, identify any missing stakeholders, identify gaps in communications or data flows, and formalize roles and responsibilities to ensure continuity and retention of institutional knowledge. A key element of this step is to develop a visual representation of the operations process – business process mapping – that documents and represents the agency's process, thereby allowing all stakeholders to see the connections between the different components of the process more easily. The tool does not have a built-in mapping function, so this activity must be performed outside the tool and then imported to the tool.

- **Step 4: Develop/Change and Implement Process.** This step involves identifying areas of improvement, and identifying changes to be made to the business process, or developing a new process. It will likely involve several iterations. The implementation can be formal or informal, depending on the complexity of the process and the agencies involved.

- **Step 5: Assess Process.** Once the new process has been implemented, it is assessed or evaluated against the identified goals. This includes identifying appropriate performance measures (based on the goals developed in Step 2), collecting the necessary data, and comparing the results against pre-implementation conditions as part of a continuous improvement process. This step also includes communicating the results with senior managers and the public.

- **Step 6: Document Process.** Once the new process has been implemented and proven effective, it is important to document the details of the new business process, the details of the evaluation process, benefits, and the roles and responsibilities of the stakeholders. Business process documentation can be as simple as an interagency agreement or as complex as a multivolume operations manual. The E-tool is populated with the documentation or references identified.

- **Step 7: Institutionalize Process.** The seventh step of business process integration may consist of adopting operational activities and processes, implementing formal policies, establishing training, or other actions. Institutionalization requires the buy-in and support of upper management, as well as additional stakeholders who have a vested interest in the outcomes of the business process. This step will have a direct impact on the long-term survival of a process within an organization.

The E-tool includes case studies (as a guide) for traffic incident management, work zones, planned special events, road weather management, and multi-agency operations. It is available at http://www.fhwa.dot.gov/goshrp2/Solutions/Available/L06_L01_L31_L34/Organizing_for_Reliability_Tools.

Two E-tool pilots were conducted following its development – one in New Hampshire focusing on road weather (winter) management, and one in Dallas focusing on traffic incident management. The results of these exercises and the associated mapping (such as that shown in Figure 1) were used in developing the workshops for this project.

Primer

The aforementioned SHRP2 efforts found that business processes and changes can be developed at a relatively low cost. However, all agencies encounter obstacles when they begin to evaluate, implement, or modify a business process, often making these efforts difficult to accomplish. Some of the obstacles in this regard may include:
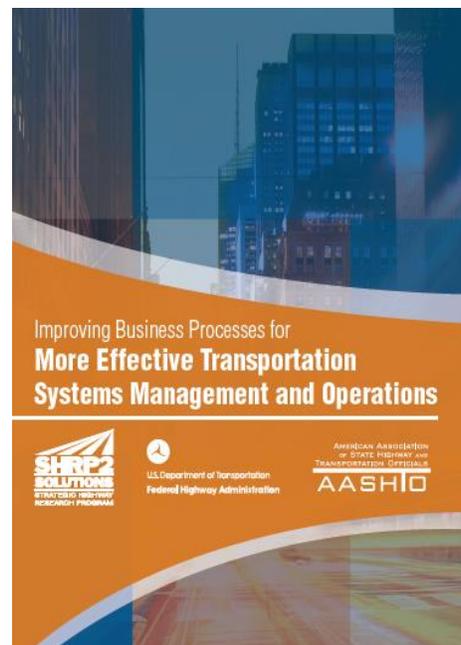
- Input, support, and agreement are required from multiple individuals (and agencies) representing different areas.

- Current processes (informal and informal) are often entrenched.

- Some processes (such as, information technology [IT] and procurement) are not geared towards TSMO, and may be beyond the control of the DOT.

- People generally dislike change.

Recognizing the need to make a strong case for effective TSMO business processes, coupled with the relatively low scores for the Business Process dimension during the CMM workshops, FHWA determined that a Primer was necessary. The goal of the Primer, "**Improving Business Processes for More Effective Transportation Systems Management and Operations" (**FHWA-HOP-16-018, January 2016), is to help readers understand the context and role of business processes in a TSMO program. The Primer differentiates supporting business processes—including program planning, procurement, and resource

allocation—from those operational activities typically associated with TSMO, yet it makes a firm connection between business processes and operations functions.

The Primer is focused on helping transportation agencies accomplish the following goals:

- Understand the importance of creating and developing sustainable business processes to effectively advance TSMO as a mainstream, core agency function.

- Assess agency business processes related to TSMO, and identify their unique requirements.

- Identify constraints and gaps within agencies' current business processes.

- Engage the right stakeholders to identify needs and develop actions and strategies that can improve business processes to support more effective TSMO programs.

The Primer is geared toward agency transportation operations managers, traffic engineering managers, and transportation planners. The overall structure of the Primer is shown in Table 3. The Primer can be accessed at https://ops.fhwa.dot.gov/publications/fhwahop16018/index.htm.

Table 3. Structure of Primer

1. Introduction 2. Business Process Development 3. Traffic Incident Management 4. Work Zones 5. Planned Special Events 6. Road Weather Management 7. Traffic Management 8. Checklist for Getting Started 9. Available Resources	• Outline of business process issues in the context of specific operational activities • Case studies of agencies or regions that have helped elevate the effectiveness of their TSMO programs by addressing certain business processes • Example questions to consider in identifying specific business process issues • Business process challenges • Potential stakeholders

Workshops

The other part of the L01 implementation effort, in addition to the Primer, was to develop and present workshops on business processes and their application to TSMO strategies. The pilot workshop was delivered in Maryland (Coordinated Highways Action Response Team [CHART]) in August 2015. It focused on the Primer and the CMM frameworks for various TSMO strategies. Based on the results of this pilot – where participants found it too similar to going through the CMM again – it was decided to completely revamp the workshop to focus more on business processes as applied to TSMO, the importance of business process mapping, and to go through and initially populate the E-Tool at each workshop location. The generic workshop agenda – identified as "Featured Workshop Topics" in the workshop brochure – is provided in Table 4. An example of the workshop brochure is provided in Appendix A.

Table 4. Featured Workshop Topics (Generic Agenda)

- Business Processes and Applications to TSMO
- Business Process Issues and Challenges
- Tools for Developing Business Processes, including Introduction to E-Tool
- Group Discussion of Issues, Needs, and Strategies that may be Addressed by Business Processes
- Initial development of business process mapping
- Applying the E-tool, including Initial Inputs
- Next Steps

Four workshops were conducted as summarized in Table 5. Tables 6, 7, 8, and 9 provide additional information for each of these workshops.

Table 5. L01 Business Process Workshops

Agency / Location	Date	Focus Area
Colorado DOT (Golden, CO)	February 1, 2017	Road weather management
Maryland State Highway Administration (Hanover, MD)	March 1, 2017	Incident management
Georgia DOT (Atlanta, GA)	April 4, 2017	TSMO overall/traffic management
Florida DOT (Tallahassee, FL)	April 6, 2017	Traffic signal control

Many of the same slides were used in each workshop, particularly in terms the introduction to business processes and their application to TSMO, business processes issues and challenges, tools for developing business processes, and the introduction to the E-tool. Slides to support the group discussion of needs and the business process mapping exercise were tailored to each workshop. These site-specific slides were developed based on a series of conference calls with the local liaison, coupled with reviews of any TSMO strategy documentation provided by the agency and by FHWA (for example, results of previous CMM workshops). The workshop slides and example process maps for each workshop location are provided in Appendices B and C. Copies of the initial E-tool inputs and business processing mapping were provided to each site.

Table 6. Workshop Summary for Colorado

Location: Golden, CO (Colorado DOT Traffic Management Center)	**Date:** February 1, 2017
Focus Area: Road Weather Management	**Local Liaison(s):** Lisa Streisfeld, Planning, Performance, and TDM Manager at Colorado DOT

Background Materials

- Sample Incident Action Plan for Winter Storm impacting Monument Hill
- Colorado DOT internal material and presentations on their activities for integrating FHWA's Pathfinder Innovation into their road weather management processes
- Draft Event Team matrix of responsibilities for major weather and special events

Number and Types of Attendees

Approximately 20. Most participants were directly involved in winter-based road weather management, including representatives from Colorado DOT Headquarters and the five regions.

Senior management, including Michael Lewis, Deputy Executive Director of Colorado DOT, who provided opening remarks

Key Points of Discussions

- Task Force Teams and Consequence Complexity Analysis have been used for about a year for special events and incident commanders, and they have been shared with maintenance staff for their use.
- Colorado DOT is adopting FHWA's Pathfinder Innovation, which incorporates National Weather Service information into winter maintenance activities. Maintenance, TMC, Regions, and Weather Service all share information before a storm. They will go back and assess performance at the end of this winter and identify ways to improve use in the future. Want to identify what value it brings to stakeholders.
- Roadway Weather Management Team – Patrol Plans tell where intuitional bad areas are located, and thermal mapping and crash data support that intuition. Plan to assess if products for de-icing need to be changed. Also, need to increase the number of patrol passes per hour, installation of snow fences, engineering design changes, and figure out how to reduce bad spots on the roadway.
- Navigator-Connect with road weather information system stations – Colorado DOT has 23 friction sensors currently deployed and looking to expand, but modeling can be used in the interim.
- Colorado DOT is beginning to look into machine-learning integration of Maintenance Decision Support System/National Center for Atmospheric Research, but this is 2 to 3 years away.
- Looking closely at performance measures, focusing on timely and consistent information going to the public (and how to measure that), and overall user satisfaction with road clearance.
- Potential business process issues identified include: processes and capabilities between regions vary; coordination across jurisdictional boundaries (for example, State and local), including providing traveler information regarding state and local roads, needs to be improved; and business processes need to realize there are differences between urban areas and the mountains and plains areas.

Overview of Mapping Exercise and Results

- The mapping exercise was based on the following scenario: Pre-Event Communications upon notification that a major snow event is 72 hours away, with 2-feet plus of snow starting in the mountains, moving into Denver and the front range, and then tapering off at the southeastern portion of the state. Storm is predicted to hit on a weekday just before PM commute.
- Mapping should address: involved stakeholders, decision making, communication links and information flows.
- Preliminary business process mapping developed by each region and headquarters.
- Some differences between regions and their perspectives were noted. Some were because of the difference in the anticipated impact within their region; and it was noted that there is a need for better understanding that events of different sizes affect the regions differently.
- Noticeable process differences included level of coordination with public information officers, and coordinating with Colorado DOT headquarters/Colorado Transportation Management Center.
- Through the workshop and the mapping exercise, headquarters (HQ) and regions gained understanding and insights into each other's roles and actions leading up to weather events, and why certain data is needed for sustaining a strong program.

Table 7. Workshop Summary for Maryland

Location: Hanover, MD (CHART Statewide Operations Center [SOC])	Date: March 1, 2017
Focus Area: Traffic Incident Management (Regional)	Local Liaison(s): Eileen Singleton - Baltimore Metropolitan Council (the Metropolitan Planning Organization [MPO]).

Background Materials

- Recent Memorandum of Understanding (MOU), *Coordination of Incident Management on Roadways Maintained by the Maryland State Highway Administration (MD SHA)*
- MOU between MD SHA and MD State Police on the Clear the Road Policy
- Resolution on Improving the Management of Traffic Incidents adopted by the Maryland Chiefs of Police Association
- Summary Report with Recommended Actions from the 2016 Baltimore region TIM Self-Assessment (using the FHWA process)

Number and Types of Attendees

Approximately 30. This was the regularly scheduled meeting of the Traffic Incident Management for the Baltimore Region (TIMBR) Committee. As such there were representatives from the MD SHA Statewide Operations Center (CHART), the MPO, local jurisdiction public works/traffic departments, state police, local enforcement, and the private towing community.

Senior management included Joey Sagal, Director of the Office of CHART and ITS Development, Maryland DOT/SHA; and Chris Letnaunchyn, Chair, TIMBR Committee.

There were also several individuals from FHWA.

Key Points of Discussions

- The Baltimore region – including CHART – has been very active in TIM for decades. They always rate high as part of their annual TIM self-assessment.
- The focus of the workshop was to discuss the MOU, *Coordination of Incident Management on Roadways Maintained by the Maryland State Highway Administration (SHA),* and how business processes might help in promoting the activities and coordination defined therein. The MOU is intended to provide a framework and guideline to promote a collaborative effort to further refine and promote the TIM program in Maryland, including identifying goals, delineating scene roles and responsibilities, establishing consistent emergency lighting guidelines, implementing TIM training, and understanding the advantages of a central information system.
- It was agreed that the development of business processes and the associated mapping could help in implementing the MOU, with the following specific items:
  - Information sharing, including automation thereof.
  - Performance measures that all stakeholders can buy into.
  - Education and outreach to decision makers, other disciplines and the public on benefits of TIM.
  - Process for defining and reporting secondary crashes.
  - Regional standard for after action reports.

Overview of Mapping Exercise and Results

The mapping exercise was a Property Damage Only crash blocking one lane. The workshop was divided into three groups based on where they were sitting for the purpose of developing a business process map. The focus of the exercise was to map the process for response and clearance under the MOU, including involved stakeholders, decision making, communication links, and information flows.

In general, there was a great deal of similarity in the mapping, with some differences resulting as some assumed a crash on the State highway system, while one group assumed a crash on the local network, resulting in slightly different approaches and processes. Perhaps the key finding was the need to report all crashes to the SOC. CHART/CAD integration would help. Also, while the MOU is focused on State Highways, it will hopefully be adopted for local roads.

Table 8. Workshop Summary for Georgia

Location: Atlanta, GA (Statewide TMC)	**Date:** April 4, 2017
Focus Area: TSMO in general	**Local Liaison(s):** Carol Bowler, P.E., TMC Manager

Background Materials:
- Georgia DOT presentation on statewide TSMO strategies and initiatives, and supporting ITS technologies
- Results from the Planned Special Event CMM Framework held in early 2017 in Atlanta

Number and Types of Attendees

Approximately 15, most of whom worked in the Statewide TMC, including consultant staff that provide support to Georgia DOT for TMC operations. There was also a representative from the Atlanta Regional Commission.

(This is a decent attendance given that the previous week, a bridge on I-85 just north of downtown had collapsed.)

Key Points of Discussions

The workshop took a major detour from the agenda in the morning, with an hour plus discussion of what was meant by TSMO. Potential TSMO strategies were discussed, coupled with the need for integration from a technical and operational perspective. The FHWA representative also noted some recent FHWA documents for developing TSMO plans.

The discussion then returned to business processes and how they could help with TMC operations. Specific examples included:

- Traffic signal coordination between State TMC and local jurisdiction systems. The Regional Traffic Operations Program corridor manager can do signal plans – corridor managers are in the field – have 2/3 operators in the TMC.
- Expanding the express toll lane/congestion pricing concept – as initially implemented on the I-75 lanes just south of Atlanta in early 2017 – to other expressways.
- Sharing closed-circuit television video images along with pan-tilt-zoom capabilities with other agencies
- Succession planning given that 80 percent of senior management at Georgia DOT will reach retirement in next few years.
- Distributing some of the functions at the TMC to the districts.

Most of the discussion focused on the latter point – how to define the respective roles and responsibilities between the Statewide TMC and district staff (and small TMCs), for what devices and strategies, and under what circumstances – in other words, "business processes".

Georgia DOT just started this process with regards to service patrols – their Coordinated Highway Assistance and Maintenance Program (CHAMP) and the new Highway Emergency Response Operators (HERO). CHAMP is primarily in the Atlanta region and dispatched from the TMC. They are looking at having the districts dispatch the HERO vehicles and take on associated responsibilities for this program.

Overview of Mapping Exercise and Results

None because of time constraints. It was determined that the scenarios under which the districts would dispatch and oversee HERO operation, and under what conditions the statewide TMC would assume responsibility, would be an excellent example of developing business processes and the associated mapping. Initial mapping was already underway by the Georgia DOT lead for the HERO program. Once this process is established, the Georgia DOT could serve as a mechanism for exploring others areas of the TSMO program and the role of HQ and the districts.

Table 9. Workshop Summary for Florida

Location: Tallahassee, FL at a DOT facility	**Date:** April 6, 2017
Focus Area: Traffic Signal Operations	Local Liaison(s): Raj Ponnaluri, PhD, P.E., PTOE, State Arterial Management Systems Engineer

Background Materials:
- Florida DOT Traffic Signal Maintenance and Compensation Agreement (with local jurisdictions)
- Report (draft) on traffic signal performance measures for Florida DOT
- Florida DOT Technical Memorandum on Adaptive Traffic Signal Control
- TSMO CMM results for Districts 1 and 3 (April 2014)
- Florida DOT presentation on the Sustainable Arterial Management Program (STAMP)

Number and Types of Attendees:

Approximately 10 in the conference room, plus 3 to 6 in each district office and the Florida Turnpike Enterprise office – all linked via video conferencing. Local agencies were also represented in some locations.

Eddie Curtis, head of the FHWA's Arterial Management & Traffic Signal Timing program, was also present in Tallahassee.

Key points of Discussions

Discussions focused on Florida DOT's STAMP program, including a presentation by Raj Ponnaluri. A STAMP Action Plan is currently being developed and will address such items as:

- Understanding district and local needs
- Facilitate district and local agency initiatives
- Build capacities through training
- Leverage existing traffic signal systems
- **Focus on process orientation (such as, business processes)**
- Learn from deployments
- Explore funding opportunities
- Evaluate national best practices

For the past 17 years, Florida DOT's TSMO focus was on the freeway network. The next logical step is to adopt an Integrated Corridor Management approach, which requires coordination (and associated business processes) with the local jurisdictions that control the arterial network. An initial list of scenarios requiring business processes in this regard include:
- Normal operations
- Minor incident (shoulder / 1 lane closed; minor or no injuries)
- Major incident (multiple lanes closed / injuries or fatality)
- Closure
- Special event
- Weather

Overview of Mapping Exercise and Results: The mapping exercise was a post AM peak crash on the freeway, with traffic diverting to a parallel signalized state route. The mapping considered the following: how a crash is identified, how diversion and extent thereof is determined, communications with local signal control, process for changing timing plans/parameters, monitoring operations, and determining the end of the scenario. Who makes decisions should also be noted.

Mapping was prepared by each district and by headquarters. Perhaps the most striking feature from the results and discussions of the mapping exercise was how similar and consistent they all were across districts in terms of processes and stakeholder notifications and coordination, indicating that business processes are in place, if not completely documented.

Outcomes and Recommendations

In general, the workshops appeared to spark interest in most attendees in the concept of business processes and their importance, the associated mapping activities, and other associated steps identified in the E-tool. The workshop size – ranging from 15 to 30 participants – seemed to work well and encourage group discussion of site-specific issues. The video-conferencing approach for including multiple DOT districts and regions – as was used in Florida – also worked well, although it was important to reach out and ask for thoughts and comments from each remote site at various points during the workshop presentation.

It is important to have the workshop focus on one specific TSMO strategy, such as road weather management, traffic incident management, and traffic signal management, and for the participants to have an understanding of this specific strategy, including relevant experience within their organization. A generic workshop (for example, TSMO in general) does not work or provide much value.

Having a previous CMM or CMF was helpful in identifying potential business process needs in terms of developing site-specific workshop content. But it is not necessary for the participants to have been involved in any such activity. As previously noted, "CMM" was not specifically identified or addressed in the workshops.

Recommendations

Should FHWA and AASHTO decide to conduct additional workshops on business processes and their application to TSMO, it is recommended that the following changes be made.

- Provide additional time and budget for pre-workshop planning. The original scope and budget was based on a generic workshop provided in four different locations. To make each workshop of any value to the attendees, pre-workshop discussions were necessary with the local liaison, coupled with reviews of pertinent written materials provide by the agency and by FHWA – additional effort that was not included in the scope or budget. It is recommended that future workshops include additional time and budget for a pre-workshop visit to discuss TSMO needs and current business process with the local liaison and perhaps a few key agency staff. This will result in better site-specific slides as to the agency's business process issues along with early identification of the most appropriate concept and scenario for the mapping exercise. (The mapping scenarios were typically developed during the lunch break based on the morning's discussions).

- Consider providing additional time and budget for follow-up activities after the workshop. As previously noted, the workshops generally seemed to spark interest in most attendees in need of developing and documenting business processes, but without a follow up and continued dialogue with the agencies – including additional business processes discussions with stakeholders, more detailed mapping of current and proposed business processes, and inputs to the E-Tool – the initial workshops may not serve a purpose.

- Provide better and complete examples of business process mapping. Many of the attendees wanted to see other examples of business process mapping, not just the ones developed for New Hampshire (weather management) and Dallas (incident management) during the pilot testing of the E-tool. Additional mapping examples covering all the TSMO strategies should be developed and /or the ones in the earlier L01 documents updated.

- Provide one or more examples of a fully developed E-tool, with input provided for all the steps and activities. It does not appear that such an example currently exists, which might require the development of a generic example.

The following enhancements to the E-tool should also be considered:

- There is no resident application for developing business processes mapping. Any mapping needs to be developed "offline" and then saved in the E-tool. Since the development of the E-tool in 2012, new open source business process mapping software have become available that could allow for the inclusion of actual business process mapping applications within the E-tool.

- The E-tool was developed to reside on a particular computer housed within a transportation agency. At the time of the development, there were concerns over security of sensitive information and the software was not developed in a manner to allow easy transfer of files between computers. As such, any information input during the workshop (on the instructor's computer) needs to be re-input to the agency's computer from the E-tool printouts as shown in Appendix C. It may be worthwhile to re-engineer the file saving approach in the E-tool. Using an agency computer for the input might help in some respects; but it was discovered during the workshop preparation that some agency firewalls prevent downloading the E-tool. Moreover, it would still not be possible to transfer inputs – other than a PDF file requiring someone to re-input – from one agency computer to another as the E-tool steps and processes continue.

- When the E-tool was developed, there were challenges with developing the E-tool as a web-based tool, compared to a downloaded executable software. With the implementation of the SHRP2 support contracts with AASHTO, it may be possible to now develop the E-tool as a web-based tool that could reside on the AASHTO or National Operations Center of Excellence (NOCoE) websites. This approach allows for a more portable, easily updatable tool compared to an executable software that resides on the user's computer. An investigation of the ability of the AASHTO or NOCoE websites to support a web-based tool in the future is suggested.

Finally, while the CMM framework for business process was not part of this project, consideration might be given to updating the level dimensions to include the extent to which business process have been mapped, and changes identified, implemented, and documented (that is, where the agency is in the 7-step process).

Appendices

A   Example General Workshop Brochure
B   Site-specific Workshop Slides
C   Example Results of E-tool / Mapping
D   Summary of Workshop Evaluations