# Executive Summary

As a capstone project in the Reliability program, SHRP 2 Project L17, A Framework for Improving Travel Time Reliability, is intended to integrate products from other SHRP 2 projects as well as from other current sources of transportation systems management and operations (TSM&O) information.

The main objectives of SHRP 2 Project L17 are the following:

- Provide the means for mainstreaming reliability findings and products.
- Develop diverse "value of Reliability/TSM&O" messaging pieces.
- Provide an accessible synthesis of reliability findings and products.
- Develop a user-driven comprehensive Knowledge Transfer System (KTS).
- Develop Reliability/TSM&O branding and a marketing plan for the KTS.

To accomplish these objectives, the project has been divided into three tracks:

- Content Building;
- KTS; and
- Branding and Communication.

This report presents the results of the four project phases dealing with (1) Synthesis, (2) Gap Analysis, (3) Gap Filling, and (4) the KTS and the work activities that have been completed to achieve the project objectives. The key recommendations and findings that have been developed are identified in the remainder of this executive summary.

## Literature Synthesis and Review

Content building activities within the project address the first three stages of effective knowledge transfer. Evaluation of the SHRP 2 program projects for relevance to the KTS content was the highest priority. All active and concluded projects under the Reliability focus area were selected to be reviewed. In addition, six projects under the Capacity focus area were identified as relevant to Reliability and TSM&O. Two projects under the Renewal focus area and one project under the Safety focus area were considered to have useful information to the existing knowledge base of Reliability and TSM&O. As a result, 21 projects from the SHRP 2 Program (12 from Reliability, six from Capacity, two from Renewal, and one from Safety) were selected to be included in the synthesis summary task.

In addition to those SHRP 2 projects, other significant reports and documents that collectively define the current state of practice in the areas of reliability and TSM&O were also reviewed and evaluated. These are referred to as Tier 1 documents because of their current importance and

stature in defining the Reliability/TSM&O state of the practice. The documents that were selected included publications from the Federal Highway Administration (FHWA), state departments of transportation (DOTs), selected websites, and other research documents and papers. As a result, 34 additional documents were added to the final list for review. Thus, 55 documents were reviewed. The complete list of these documents is provided in Appendix A.

The document review process involved assigning each of the 55 documents to team members based on their areas of expertise and involvement with the document production. As part of the document review, a high-level overview was prepared for each document according to the following topical areas:

- Summary of the work;
- The project's recommendations for future research;
- Practical application procedures and opportunities;
- Caveats or limitations associated with the key products and findings; and
- Related work that may also be of interest.

In order to concentrate the review process output in a single location, a synthesis web-based tool was developed so that the team could input the results of the document review and easily access and summarize that information.

## Addressing Gaps in Knowledge

The SHRP 2 Project L17 research plan called for conducting gap-filling research in Phase 3. As part of the Phase 2 gap analysis activities, the research team performed an extensive evaluation of gaps that act as a barrier for mainstreaming TSM&O practices. As a result of a prioritization exercise, the research team identified as high priorities the following gap-filling projects:

- Project 1: Persuasive TSM&O Case Study Briefing Book
- Project 2: Deployment Guidance for TSM&O Strategies
- Project 3: TSM&O Program and Budget Development
- Project 4: Standard Evaluation and Reporting Procedures for TSM&O Strategies
- Project 5: Synthesis on Valuing Travel Time Reliability
- Project 6: Key Sub-Audience Business Case and Communication Strategies to Support Mainstreaming of Transportation Systems Management and Operations (TSM&O)
- Project 8: Integration of Operations into Transportation Decision Making

Project 7 was replaced by Project L31. Project 8 was funded through the Capacity research area of SHRP 2. Projects 9, 10, and 11 were judged to be of low or medium priority and were not pursued. The facts and statistics described in Project 12 were, in fact, provided in the case study briefing book pages (Gap-Filling Project 1) and the business case primer (Gap-Filling Project 6). The six L17 gap-filling projects can be found at this SHRP 2 web page: http://www.trb.org/main/blurbs/169243.aspx.

Following review and input from the Technical Expert Task Group (TETG), the research team finalized the list of gap-filling projects and developed refined work plans for each project. Each of these seven projects was completed during the Phase 3 effort. Table ES.1 describes each of the project descriptions and the guidance provided for each of the gap-filling activities.

## Knowledge Transfer System

Effective knowledge transfer begins with new knowledge that is achieved, often in incremental bits and pieces, through basic or applied research, new experiences, and even the outcomes of trial-and-error experiments (Learn and Capture). In order to maximize their collective value,

*Table ES.1.  Gap-Filling Projects*

| # | Description | Objective | Product | Schedule in Months | Priority for L17 |
|---|---|---|---|---|---|
| 1 | Persuasive TSM&O Case Study Briefing Book for Decision Makers | To provide compelling examples from state and regional experience that support the benefits of TSM&O in terms that are directly relevant to decision makers. | Mini briefing book for decision makers | 9 | High |
| 2 | Deployment Guidance for TSM&O Strategies | To provide guidance for matching the deployment of TSM&O strategies to institutional, highway, and traffic conditions. | Guidebook | 9 | High |
| 3 | TSM&O Program and Budget Development | To develop guidelines for determining short-term programs and budgets as well as procedures for identifying long-term needs for TSM&O within an agency. | Guidebook | 9 | High |
| 4 | Standard Evaluation and Reporting Procedures for TSM&O Strategies | To provide guidance on how to conduct field evaluations of operations strategies and to use the results both internally and externally. | Guidebook | 6 | High |
| 5 | Synthesis on Valuing Travel Time Reliability | To provide interim guidance on how to value travel time reliability until a full-scale research project is completed. | Guidebook | 6 | High[a] |
| 6 | Key Sub-Audience Business Case and Communication Strategies to Support Mainstreaming of TSM&O | To develop business case and communication strategies for up to an additional six sub-audiences to supplement brand, communication strategies, and sample materials being developed as part of the L17 scope. | Business cases and report | 6 | High |
| 7 | Development and Delivery of CEO Workshops | To conduct workshops for new CEOs and Chief Engineers to demonstrate TSM&O benefits and successful practices. | Workshop materials and briefing report | 9 | High[b] |
| 8 | Integration of Operations into Transportation Decision Making | To provide technical staff and policy makers the decision-making structure and supporting information needed to integrate consideration of operational improvements into overall transportation decision making during planning, programming, corridor planning, and NEPA/permitting. | Separate application in TCAPP | 12 | High[c] |
| 9 | TSM&O in the "new context of" constrained transportation improvements | To provide resource material that focuses on identifying the set of recent changes in the context for transportation improvement—state and regional—that have constrained conventional (capacity) improvements and imply greater need for focus on efficient and effective operations of the existing network. The material would be designed to be used by policy and planning staffs. | "Responding to Constraints" handbook and related web material | 9 | Medium |
| 10 | Development of a TSM&O Course | To develop course materials for one graduate-level course on TSM&O. | Course material and "train-the-trainer" material | 9 | Medium |
| 11 | Guidance and Application Procedures for Predicting the Performance of TSM&O Strategies | To develop guidance for applying analysis, modeling, and simulation tools in the evaluation of emerging TSM&O strategies. | Guidebook | 12 | Low |
| 12 | Facts and Stats for TSM&O | To summarize readily available quantitative information regarding implementation statistics, benefits, and costs of TSM&O strategies to incorporate in the KTS. | Database and report | 6 | High |

Note: Shaded rows represent recommended gap-filling projects for L17 Phase 3. NEPA = National Environmental Policy Act of 1969; TCAPP = Transportation for Communities—Advancing Projects through Partnerships.

[a] A full-scale follow-on project is recommended for developing a recommended practice for valuing travel time reliability.

[b] This project has been replaced by Project L31.
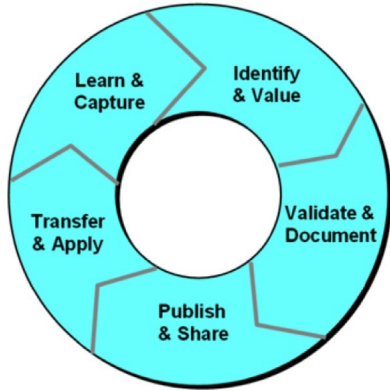
[c] This project became part of Project C01.

**Figure ES.1.  The knowledge transfer process.**

these bits and pieces of new knowledge are brought together and interrelated through a synthesis type of activity (Identify and Value). A critical review of the synthesized information will often reveal knowledge gaps where the accumulated knowledge is not sufficient to produce a cohesive, useful, and usable product. Where such knowledge gaps are found, they must be filled in order to avoid a premature disruption of the overall knowledge transfer lifecycle process (Validate and Document).

Development of a KTS within the project addresses the final two stages in effective dissemination of knowledge and information. When all critical gaps have been filled, the new knowledge set will be fully functional and usable to everyday practitioners (Publish and Share). The new knowledge set enters into the mainstream of practice through awareness, acceptance, and application by the practitioners (Transfer and Apply).

In order to identify and consider the various elements and requirements of an effective knowledge transfer within the project scope, the team reviewed websites and other means of transferring information both internal and external to the transportation sector. The team has also outlined several options for the KTS website design. This knowledge transfer process is illustrated in Figure ES.1.

At each stage in the knowledge transfer process, interaction with key audiences—both users and key authorizers—is needed to ensure that audience context, needs, and issues are addressed.

## Key Findings

The state of the practice is still developing. Right now there is no organized KTS within the SHRP 2 Reliability program areas of interest. In addition, there are no systematic activities in place to identify and fill knowledge gaps. One essential finding from the research is that travel time reliability is not a stand-alone topic, but instead is integral to the larger practice of TSM&O. For this reason the design of the KTS must be broad enough to provide the umbrella structure needed to incorporate the many individual elements of TSM&O. In addition, for a KTS to be completely effective, it is necessary to transfer both explicit and tacit (anecdotal) information. Although content in the form of documents, reports, and other published information is a key feature of knowledge transfer, equal importance must be given to the knowledge developed by individual practitioners that can only be shared by more direct communication in the form of workshops, peer exchanges, blogs, forums, and other social media.

Additional key findings regarding knowledge transfer include the following:

- There are four principal audiences whose needs must be met: policy makers, practitioners (important subsets also exist for these last two audiences), researchers, and the public at large.
- A fair amount of explicit information is already available through nine different TSM&O-focused websites. However, nontechnical information is not well supported by these websites, and most have agendas other than just knowledge transfer. These agendas influence the information and the way that knowledge is made available.

- The kinds of knowledge needed by the principal audiences include
  - Definitions and FAQs;
  - Research results;
  - Analytic tools and procedures;
  - Standards and regulations;
  - Benefit and cost information and database;
  - Institutional, program, and process guidance;
  - Outreach and marketing materials;
  - Current and upcoming professional activities;
  - Technical and peer interchange and interaction opportunities; and
  - Education and training.
- Most websites and sponsors have agendas other than just knowledge transfer; these agendas influence the information and the way that knowledge is made available.
- No current systematic activities exist to identify and fill knowledge gaps.
- Activities necessary to developing an effective KTS go beyond simply storing relevant knowledge and include
  - Identifying important knowledge;
  - Capturing and storing the important knowledge;
  - Identifying use audiences;
  - Analyzing, understanding, and organizing the relevant knowledge;
  - Sharing, transferring, and disseminating the relevant knowledge;
  - Discussing and interacting among and within use audiences;
  - Maintaining the site; and
  - Updating and expanding the KTS.

Based on the background summarized previously, certain key conclusions were reached regarding the important directions for a TSM&O KTS:

- A web-based tool can provide convenient one-stop access to the complete range of existing and new TSM&O information.
- There is no need to duplicate the extensive libraries of existing websites, and a cooperative strategy would be beneficial among existing website sponsors.
- Prioritization of information available on existing websites, as well as additional synthesis, cataloging and cross-classifying, is needed. In particular, the needs of policy makers, planners, and managers are not well addressed by existing website resources, and there are gaps that can be filled with only modest resources.
- The KTS should incorporate best practice features, including social media and outreach capabilities.
- An effective KTS will require active and ongoing management. While there is a range of management burdens implied for the several following options, increased functionality introduces the need for increased management (and funding).

Five options, which are not mutually exclusive, have been defined in Chapter 3 for consideration.

Options 1 and 2 have relatively modest burdens:

1. Support of coordinated, cooperative modifications to selected existing TSM&O-focused websites to better achieve overall KTS objectives.
2. One or more single function websites that would provide specific knowledge category resources on separate websites.

Options 3 through 5 introduce significant management responsibilities. Even when the activities are restricted to a website alone, the scope and sustaining requirements suggest a dedicated

staff. Option 5 adds activities beyond the web function that is the focus of this project. However, the "Operations Center of Excellence" concept with its external and "live" activities and with the implied sponsor and sustainability may also have the stronger likelihood of supplying the full range of needed KTS functions.

3. A comprehensive web-based portal with searchable links to other existing websites plus selective creation and hosting of new material.
4. A new stand-alone, comprehensive website hosting the complete range of relevant knowledge categories for all relevant topics.
5. An Operations Center of Excellence-based web portal integrated with other related non–web-related and live KTS activities.

## Key Recommendations

The SHRP 2 Project L17 contribution to a complete and functional KTS should be a web-based product. Phase 3 began by developing an initial version of the site map, site structure, content structure, and functionalities for a TSM&O website. Based on the analysis presented in Chapter 3 and on an evaluation of the five options described previously, the following recommendations are made:

- The portal approach (Option 3) is the most efficient because it combines needed new content with connections to existing resources.
- The KTS will be developed and brought online incrementally to retain flexibility regarding ultimate hosting and relationships to existing sites.
- The useful results (including reports, analysis methods, and tools) of recently completed SHRP 2 Reliability program projects will be among the first elements to be included on the new website.
- Gap-filling work activities identified earlier in Table ES.1 will also become new knowledge elements on the website.

Finally, a conversation was initiated at the start of Phase 3 with SHRP 2 staff, TETG members, and Technical Coordinating Committee (TCC) members for the purpose of resolving the question of both mid-term and long-term sustainability of the KTS. In summary, while initial site design, beta hosting, and improvements in response to community reviews will take place within the current scope of this project, consideration must be given to supporting the site hosting and maintenance activities after the current project. In addition, experience with other SHRP 2 web projects indicates that a range of improvements will result from initial experience that will exceed the scope of the current project.

In Phase 3, the website design considered two key factors:

- *Existing knowledge transfer resources.* KTS-like activities by agencies and associations were reviewed for strengths and weakness. The state of the practice in KTS-like activities outside the domain was also reviewed as the basis for the KTS prototype development.
- *State of community of practice.* The audiences relevant to reliability and, more broadly, to TSM&O are fragmented both by type of institution and individual organizations into a set of sub-communities (such as individual practitioners in a state DOT, practitioners in a consultancy, or members of a committee), which themselves are only weakly established within their own context.

The initial KTS website has six basic resources:

1. Searchable database with all SHRP 2 final products, including a standardized synthesis of each and key wording for search.

2. Links to (and syntheses of) a limited number of other key TSM&O documents in areas not covered by SHRP 2 research.
3. Reports on major research gaps in standards format.
4. FAQs.
5. A glossary, developed by the TRB Regional Transportation Systems Management and Operations (RTSMO) Committee.
6. Business case and outreach materials for custom tailoring.

The most important functionality of the website is the search mechanisms for finding SHRP 2 products as well as a limited number of selected non-SHRP 2 TSM&O documents (being added to by contract over the next 2 years). The search can be completed by a combination of topic and knowledge type and by date or author agency.

The initial site (and its functions) has been reviewed by the SHRP 2 L17 TETG and circulated to many organizations, including the TRB RTSMO Committee, ITE, the Intelligent Transportation Society of America, and the AASHTO Subcommittee on Systems Operations and Management. Only a few (but very helpful) comments have been received.

Under the current L17 scope and budget with the maintenance modification, the KTS website will be maintained through December 31, 2014. Additional SHRP 2 Reliability products will be added to the website as they become available. A limited number of non-SHRP 2 documents will also be added, and the calendar will be updated on a quarterly basis. For more information about the KTS, refer to the SHRP 2 L17 website: http://www.trb.org/main/blurbs/169243.aspx.

## Branding and Communication

At each stage in the knowledge transfer process, interaction with key audiences—both users and the key authorizers—is needed to ensure that audience context, needs, and issues are addressed. The SHRP 2 Project L17 research approach includes several representative key audience "communities" that provide perspective and guidance to the development of the KTS as well as branding and communication activities.

Phases 1 and 2 of the project were guided primarily by the user community, a diverse group of practitioners representing a key target audience for the research. A second group, the institutional community, represented key organizations and agencies that have existing websites as well as a long history of supporting individual aspects of TSM&O. Another key audience identified for the KTS was the research community with specific interest in supporting academic curricula changes that will enhance the ability to advance TSM&O within the transportation sector. To support this perspective, the project team selected members for the Academic Advisory Team. The final outreach group identified to support the research was the user network—an evolving group of practitioners who are included in the project because of their interest in it. It is anticipated that members of the established outreach communities will encourage peers to join the user network as the project continues.

The user community met 11 times during the project and provided input for each of these tasks:

- Content synthesis validation;
- Identification of target audience segments;
- Development of draft business cases;
- Validation and prioritization of existing content gaps;
- Development of the brand promise;
- Key messages for communication to target audiences;
- Input on website features and usefulness; and
- Input on communication materials.

The institutional community met twice during the project. Its initial discussions centered on the development of a knowledge transfer framework, as well as lessons learned with respect to successful communication through a website and development of a supporting brand.

As the project progressed, the growing interest in SHRP 2 Reliability implementation and the creation of an "Operations Center of Excellence" eliminated the need for a formal institutional community. Many of the members of this group take part in these higher-level discussions and are, therefore, well aware of the advances made in the SHRP 2 L17 project research. In conjunction with the TETG chairman, it was decided that this community would not be engaged further within the L17 project. Members would be consulted and updated on an individual basis as well as within meetings and workshops external to the project.

The synthesis phase of SHRP 2 Project L17 included identification of existing branding and communication activities within TSM&O. This included a detailed review of 25 websites at the national, state, and local levels in order to identify common themes across websites, key terms used to communicate these themes, communication messages, and a general understanding of the effectiveness of each site at reaching its intended audience.

The branding synthesis provided the basis for the development of target audience definitions and the key messages that are most likely to resonate with each. Phases 1 and 2 resulted in a definition of three essential target audiences and the messages to communicate with each. These audiences and related messages provide the "case for change" needed to advance TSM&O and have been validated by the user community. Phase 3 included the development of a brand promise along with business cases and guidance on using them to communicate the value of TSM&O. These outcomes are documented in the business case primer, which is available as Gap-Filling Project 6 at http://www.trb.org/main/blurbs/169243.aspx and on the KTS. Phase 4 focused on the development of communication materials that provide the means to deliver the business case messages.

## Key Findings

The target audience for TSM&O and its related aspect of travel time reliability is divided into three types:

- The Investment Decision Maker (Policy Maker) audience represents individuals who make decisions or recommendations related to allocating funds for improvements. These are often the policy makers within an agency, but can also include senior and mid-level managers who make recommendations for allocation of funding for TSM&O improvements.
- The Implementer (Practitioner) audience includes individuals who implement TSM&O improvements or services, including real-time operations as well as those responsible for longer-term related project development and design.
- The Traveler audience represents both business and personal travelers whose individual decisions about their route, time of departure, distance, or schedule affect the transportation system.

It is clear from the branding synthesis and interface with the user community that effective communication is audience dependent. It is essential to segregate the individual "sound bites" into the target audiences where they will be the most effective. Chapter 4 provides the key messages that have been drafted for each of these audiences.

To develop the brand and supporting communication materials in Phase 3, the project team sponsored a branding workshop with members of the user community and the TETG. This workshop drew from the target audience and key messages developed previously to identify essential terms and themes that the brand must effectively communicate. The interface between these two groups within a workshop setting ensured broad support of the initial brand developed within the project. Following the branding workshop, other outreach groups considered the results of this meeting and provided further recommendations, validation, and support for the draft brand

and messages. When the beta version of the KTS was developed, the brand and messages were further tested and enhanced to increase the brand's ability to represent and advance TSM&O.

The business case primer was developed following the branding workshop. The primer provides instructions on why a business case is important, definitions of the target audience, how to use the key messages in various engagement opportunities, and sample materials for individual target audiences. Four primary materials were developed in Phase 4 as a means to deliver the messages available through the business case primer:

- A brochure targeted to the traveling public;
- A fact sheet for implementers to use in spreading the word; and
- Two slide presentations (one for implementers and one for decision makers).

These communication materials were reviewed by the user community, the SHRP 2 L17 project team, and the TETG members. The intent was to provide them through the KTS in a format that could be adjusted for use by individual agencies. A communication strategy was the final deliverable for Phase 4. This document is intended to provide recommendations for KTS outreach following the completion of the L17 research.