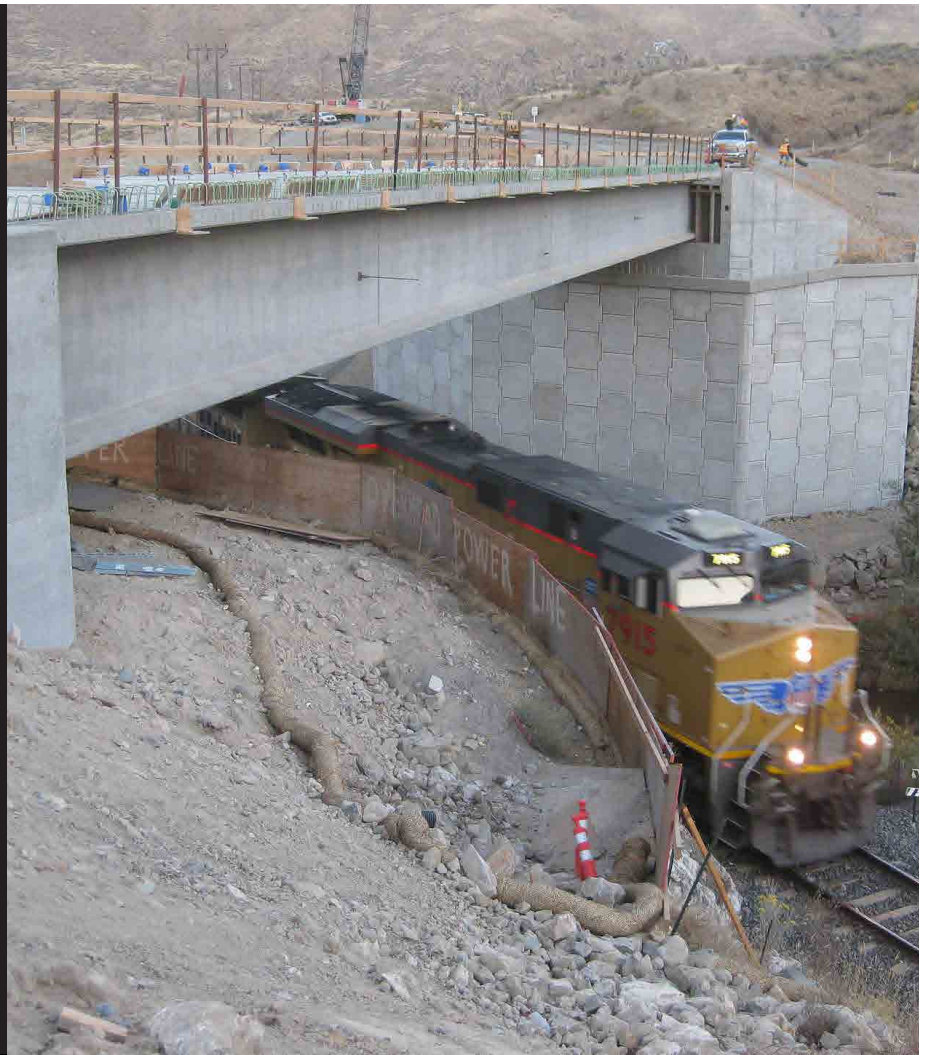


FHWA Research and Technology Evaluation



Managing Risk in Rapid Renewal Projects

Final Report
September 2018

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Foreword

The Federal Highway Administration's (FHWA's) Research and Technology (R&T) Program furthers the FHWA Office of Research, Development, and Technology's goal of ensuring transparency, accessibility, and responsiveness of R&T for all stakeholders.

This report examines how the program Managing Risk in Rapid Renewal Projects, implemented by FHWA with assistance from the second Strategic Highway Research Program, influenced State transportation departments' incorporation of new risk-management practices and achievement of cost and schedule savings.

This report should be of interest to practitioners, researchers, and decisionmakers involved in the planning and execution of infrastructure projects.

Hari Kalla, P.E.
Associate Administrator, Office of Research,
Development, and Technology

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16. Abstract In March 2013, the States of Florida, Minnesota, Oregon, and Pennsylvania were selected as lead adopters of the second Strategic Highway Research Program (SHRP2) product Managing Risk in Rapid Renewal Projects (R09). This report evaluates those States' progress in disseminating R09 concepts to staff, adopting R09 concepts into State procedures, and realizing project cost and time savings. Though these States initially found the spreadsheet-based risk-management tool associated with R09 too complex and Minnesota ultimately opted out of R09 adoption, the remaining lead-adopter States succeeded in disseminating R09 to staff, adopting R09-inspired risk-management procedures, and tailoring this R09 tool and workshops to their needs. It is still too early to rigorously examine cost and time savings that result from the risk-mitigation strategies presented during the R09 workshops, but Oregon and Arizona (a SHRP2 Round-4 R09 user) presented projects that realized time and cost savings due to R09. This report provides recommendations on how to improve the adoption of risk-management procedures and lessons learned from these lead adopters and should be of especial interest to other State and local transportation departments that are interested in implementing innovative risk-management procedures.			
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SI* (MODERN METRIC) CONVERSION FACTORS				
APPROXIMATE CONVERSIONS TO SI UNITS				
Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in ²	square inches	645.2	square millimeters	mm ²
ft ²	square feet	0.093	square meters	m ²
yd ²	square yard	0.836	square meters	m ²
ac	acres	0.405	hectares	ha
mi ²	square miles	2.59	square kilometers	km ²
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft ³	cubic feet	0.028	cubic meters	m ³
yd ³	cubic yards	0.765	cubic meters	m ³
NOTE: volumes greater than 1000 L shall be shown in m ³				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
ILLUMINATION				
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m ²	cd/m ²
FORCE and PRESSURE or STRESS				
lbf	poundforce	4.45	newtons	N
lbf/in ²	poundforce per square inch	6.89	kilopascals	kPa
APPROXIMATE CONVERSIONS FROM SI UNITS				
Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
AREA				
mm ²	square millimeters	0.0016	square inches	in ²
m ²	square meters	10.764	square feet	ft ²
m ²	square meters	1.195	square yards	yd ²
ha	hectares	2.47	acres	ac
km ²	square kilometers	0.386	square miles	mi ²
VOLUME				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m ³	cubic meters	35.314	cubic feet	ft ³
m ³	cubic meters	1.307	cubic yards	yd ³
MASS				
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
TEMPERATURE (exact degrees)				
°C	Celsius	1.8C+32	Fahrenheit	°F
ILLUMINATION				
lx	lux	0.0929	foot-candles	fc
cd/m ²	candela/m ²	0.2919	foot-Lamberts	fl
FORCE and PRESSURE or STRESS				
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in ²
*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)				

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List of Abbreviations and Acronyms

Abbreviation	Term
AASHTO	American Association of State Highway and Transportation Officials
ADOT	Arizona Department of Transportation
DOT	Department of Transportation
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
IAP	Implementation Assistance Program
IPD	Federal Highway Administration Office of Innovative Program Delivery
LPA	local public agency
MnDOT	Minnesota Department of Transportation
MOE	measure of effectiveness
ODOT	Oregon Department of Transportation
PennDOT	Pennsylvania Department of Transportation
PMP	project management plan
R&T	research and technology
R09	Managing Risk in Rapid Renewal Projects
ROI	return on investment
SHRP2	second Strategic Highway Research Program
TRB	Transportation Research Board

Executive Summary

Purpose of the Evaluation

Managing Risk in Rapid Renewal Projects (R09) is a product with multiple components offered under the second Strategic Highway Research Program (SHRP2).¹ R09 is being evaluated as a part of the Federal Highway Administration's (FHWA's) Research and Technology Evaluation Program. SHRP2 Implementation Assistance Program grants were delivered to States (that completed a competitive application process) to receive and implement R09 components, namely the *Guide for the Process of Managing Risk on Rapid Renewal Projects*, train-the-facilitator trainings, and project-specific risk-management workshops.⁽²⁾ The goal of the evaluation was to understand how the R09 product and implementation assistance changed risk-management practices and affected project delivery and costs for four lead-adopter State transportation departments—Florida, Minnesota, Oregon, and Pennsylvania. This report should be of particular interest to other State and local transportation departments considering adoption of innovative risk-management procedures for rapid-renewal projects and to architects of future highway-research programs.

Program Description

R09 is being executed by the Project Delivery Team within the FHWA Office of Innovative Program Delivery. R09 product development was spearheaded by the Transportation Research Board (TRB) in conjunction with subject-matter experts and provides practical tools and techniques for minimizing risk (e.g., project-cost and schedule overruns) and exploiting opportunities on transportation projects that are to be implemented in an accelerated (i.e., rapid-renewal) timeframe. The tools offered in R09 include risk-management checklists, materials for executing risk management strategies (e.g., a spreadsheet-based risk-management template that outlines a risk-analysis process), and the curriculum for a 2-day Training for Risk Workshop Facilitators (train-the-facilitators) course that instructs facilitators in how to lead R09-related workshops and use the R09 risk-management template. Together, these tools are intended to reduce project delays and cost overruns that can arise from unmanaged risks on rapid-renewal projects.

Methodology

The evaluation honed in on three areas—dissemination, adoption, and project-delivery outcomes:

- Dissemination focused on the level of exposure that lead-adopter States had to R09 concepts and processes.
- Adoption assessed the extent to which lead-adopter States have institutionalized the R09 process and developed a standard method of applying the R09 process.
- Project delivery began to evaluate the effect of R09 on project-cost and -schedule estimates.

¹The “R” in R09 refers to the “Renewal” Focus Area of SHRP2 products. R09 was the ninth product developed in that focus area.

The evaluation analyzed project-planning and agency-wide documents to identify how States have used R09 concepts and incorporated them into standard processes. Additionally, discussions with State transportation department staff filled in gaps in the document data and provided more context. The evaluation team held discussion sessions with various stakeholders: the four lead-adopter State transportation departments, TRB, and the FHWA contractors who facilitated R09 development and deployment.

Findings

After reviewing State documents and conducting interviews, the evaluation team distilled several findings, which are grouped by evaluation area. While most findings are positive, a few offer key lessons learned by lead-adopter States. These findings are as follows:

- Dissemination:
 - SHRP2 and FHWA support enabled lead adopters to expose more staff to risk management.
 - SHRP2 and FHWA support enabled lead adopters to host their own risk-management training/education events.
- Adoption:
 - The R09 template can be too complicated for smaller projects, and staff may not retain proficiency if the tool is not used frequently.
 - R09 influenced lead adopters to incorporate risk management into their standard policies, processes, and procedures.
 - R09 encourages users to assess and address risk throughout the project lifecycle.
 - R09 encourages a broad set of users from State transportation departments to participate in risk management.
 - It is easier to adopt new processes, like R09 risk management, with strong support from upper management.
 - Lead adopters did not acquire additional staff or designate staff for official risk-management positions.
- Project Delivery:
 - Applying R09 processes can result in improved estimates, budgets, and project cost savings.
 - Applying R09 processes can result in enhanced project delivery and schedule savings.²

Recommendations

In pioneering efforts to adopt innovative risk-management processes for rapid-renewal projects, lead adopters realized several lessons that future adopters should consider while implementing innovative risk-management processes, whether R09-based or not. Potential adopters should consider reaching out to lead adopters to learn further specifics to aid in the advancement of their risk-management programs. The recommendations to potential adopters are as follows:

²While some States reported that R09 processes did not always lead to schedule savings, the processes helped develop more accurate and realistic schedules given the risks that were identified, assessed, and mitigated. (Internal correspondence between FHWA and Joseph Luna (evaluation team), February 2018.)

- Anticipate the need for upper-management and political support in implementing a risk-management program.
- Engage local stakeholders in prioritizing risks and identifying mitigation strategies.
- Establish processes to ensure that project risks are continually managed, even with staff turnover.
- Customize risk-management tools to the specific needs of each State.

1. Introduction

1.1 The Research and Technology Evaluation Program

The Federal Highway Administration (FHWA) initiated an effort to evaluate its Research and Technology (R&T) development program. Leaders of governmental transportation R&T programs need to be able to communicate the impacts of their programs effectively. The R&T Evaluation Program helps FHWA assess how effectively it is meeting its goals and objectives and providing useful data to inform future projects.

1.2 FHWA Innovative Program Delivery

FHWA is committed to developing innovative ways to improve the Nation's highway system. Changing demographics, financial constraints, and emerging technologies are forcing transportation agencies to adapt and pursue innovative approaches to financing and delivering transportation projects. FHWA helps State and local agencies consider and adopt these new strategies by providing research, guidance, and technical assistance.

FHWA Office of Innovative Program Delivery

FHWA's Office of Innovative Program Delivery (IPD) provides tools, expertise, and financing to help the transportation community explore and implement innovative strategies to deliver costly and complex infrastructure projects. IPD provides State and local agencies with the resources and tools to explore innovative strategies for financing and project delivery.

The IPD Project Delivery Team offers assistance to transportation agencies in delivering complex transportation improvements for projects with costs of \$500 million or greater. The Project Delivery Team is overseeing the Managing Risk in Rapid Renewal Projects (R09) research and implementation effort; the Team offers training, produces tools and templates, delivers technical assistance, and develops resources such as case studies.¹

Innovative Program Delivery Research and Development

Within the *R&T Agenda*, there are five objectives designed specifically for IPD to address.^(3,4) Each objective is bolstered by several strategies, as follows:

- Conduct research in the areas of financial stewardship and innovative program delivery.
- Support innovative financing approaches that promote efficient, accelerated project delivery.
- Develop innovative procurement and revenue-generation tools and technical resources.

¹There have been recent changes to FHWA's organizational structure. The Project Delivery Team is now called the Major Projects Team, which is now part of the FHWA Office of Infrastructure.

- Provide technical support and oversight for major projects.
- Build technical expertise at the Federal, State, and local levels in the use and stewardship of innovative program delivery methods and programs.

1.3 Risk-Management Research

Managing Risk in Rapid-Renewal Projects

Risk management has become a focus area for transportation agencies because unmanaged risks can lead to project delays and higher costs. Project delays and cost overruns are extremely likely for projects with accelerated timelines. As agencies increasingly seek ways to reduce project costs and timelines, risk management will become increasingly important. Previous research and guidance on risk management applied to transportation projects in general but did not account for the unique features of rapid-renewal projects. Rapid-renewal projects are those that are intended to minimize delivery schedules, cost overruns, and traffic disruption due to construction, such as accelerated bridge construction. When agencies did use formalized risk-management processes, it was often for large, complex projects with estimated costs of \$500 million or greater and not smaller infrastructure projects.

The second Strategic Highway Research Program (SHRP2) advanced State-level implementation of these risk-management concepts through the SHRP2 R09 product. A major component of this product was the *Guide for the Process of Managing Risk on Rapid Renewal Projects*, which will be referred to as the *R09 Guide* from here forward.⁽²⁾ The guide provides tools and techniques for identifying, assessing, mitigating, allocating, and monitoring risk to help agencies optimize innovation, minimize schedule and budget risks, and ultimately build better projects. The guide was intended to impart specific advice that would be practical for rapid-renewal projects for agencies. Stakeholders involved in the design and development of the guide said the following:

“There was a lot of general info on risk management, more detailed Monte Carlo simulation. We were aiming for something in between those.”²

“Some things make [rapid-renewal projects] different: innovative techniques (accelerated bridges), project delivery, design-build. That hadn’t been dealt with in a formal way. That was important. The thing about rapid renewal: not just cost and schedule, but also disruption. We had to expand project performance schedule to include cost, schedule, and disruption. Added longevity for postconstruction. One thing I do quite a bit is decision analysis where we take multiple objectives and figure out the tradeoffs. Need to find the cheapest, fastest, least disruptive. Had to combine all that.”³

By applying R09 tools and techniques, agencies were expected to anticipate potential risks on rapid-renewal projects, which would lead to better financial management of agency capital budgets, fewer changes due to unanticipated issues, and more disciplined decisionmaking regarding crucial project matters. Tools offered through the R09 product included a comprehensive guide with checklists and an example project application, a spreadsheet (risk-management template) that allowed users to outline a risk-analysis process, and a 2-day train-the-facilitator course that instructed participants on

²Transportation Research Board (TRB) Researcher. Phone interview conducted by Alison Bisch and Joseph Luna (evaluation team), August 2016.

³Contractor Representative. Phone interview conducted by Alison Bisch and Joseph Luna (evaluation team), July 2016.

how to apply the risk-management process and helped them understand how to facilitate R09 risk-management workshops.

FHWA offered SHRP2 Implementation Assistance Program (IAP) grants to 14 States over 3 IAP rounds to implement the R09 risk-management approach. Round 1–award recipients included two proof-of-concept pilots: Florida and Georgia State transportation departments. These packages included a demonstration workshop with each State to further refine the product and ensure the packages were ready for full implementation. Round 2–award recipients included four lead-adopter State transportation departments: Florida, Minnesota, Oregon, and Pennsylvania. The six Round 4–award recipients of user-incentive grants included the following: Alaska, Arizona, Florida, Pennsylvania, Wisconsin, and the FHWA Federal Lands Highway Division.⁴ Two other State transportation departments were added to the list for user-incentive opportunities because they expressed interest in risk management: Alabama and Puerto Rico. Recipients were able to use IAP funds for activities such as hosting workshops to teach the benefits of the R09 product for one of their projects and expose staff to the approach, developing risk-management plans for specific projects, updating risk-management policies and guidance, and purchasing risk-management software. FHWA expected all grant recipients to complete implementation of the R09 product by the end of 2017.

1.4 Report Structure

Chapter 2 presents the study design and specifies evaluation areas. Chapter 3 describes the evaluation team’s main findings. Chapter 4 discusses a series of recommendations, and chapter 5 summarizes conclusions.

⁴The R09 product was not offered in every round of the SHRP2 IAP. Further, prospective States applied for the SHRP2 IAP; as a result, a randomized experimental design was not possible for this evaluation.

2. Evaluation Design

2.1 Overview

This chapter describes the evaluation approach, including the R09 program logic model, evaluation questions, evaluation hypotheses, and the data used to test the hypotheses.

The goal of the evaluation was to understand how the R09 product and FHWA implementation support changed State-level risk-management practices for rapid-renewal projects. The evaluation focused on the four State transportation departments that received lead-adopter implementation-assistance grants through Round 2 of the SHRP2 IAP—Florida, Minnesota, Oregon, and Pennsylvania—though the evaluation team also drew comparative insights from other R09 IAP recipients. The specific policy changes varied by State, so the evaluation team attempted to measure both outcomes that were common among all States and outcomes that were unique to individual projects and States.

The Transportation Research Board (TRB) oversaw the development of the requirements for R09 products and processes and managed the contractors who planned, updated, and deployed the *R09 Guide* and associated trainings.⁽²⁾ Table 1 depicts the primary stakeholders examined for this evaluation report.

Table 1. Major stakeholders.

Stakeholder	Role
FHWA IPD	Technical program lead and deployment manager
AASHTO	IAP co-lead
TRB	Reviewer and manager of r09 research products
FHWA Contractor	Author of <i>R09 Guide</i>
FHWA Contractor	Deployer of <i>R09 Guide</i>
FDOT	SHRP2 IAP funding recipient (Round 2)
MnDOT	SHRP2 IAP funding recipient (Round 2)
ODOT	SHRP2 IAP funding recipient (Round 2)
PennDOT	SHRP2 IAP funding recipient (Rounds 2 and 4)
ADOT	SHRP2 IAP funding recipient (Round 4)

AASHTO = American Association of State Highway and Transportation Officials; FDOT = Florida Department of Transportation; MnDOT = Minnesota Department of Transportation; ODOT = Oregon Department of Transportation; PennDOT = Pennsylvania Department of Transportation; ADOT = Arizona Department of Transportation.

2.2 Program Logic Model

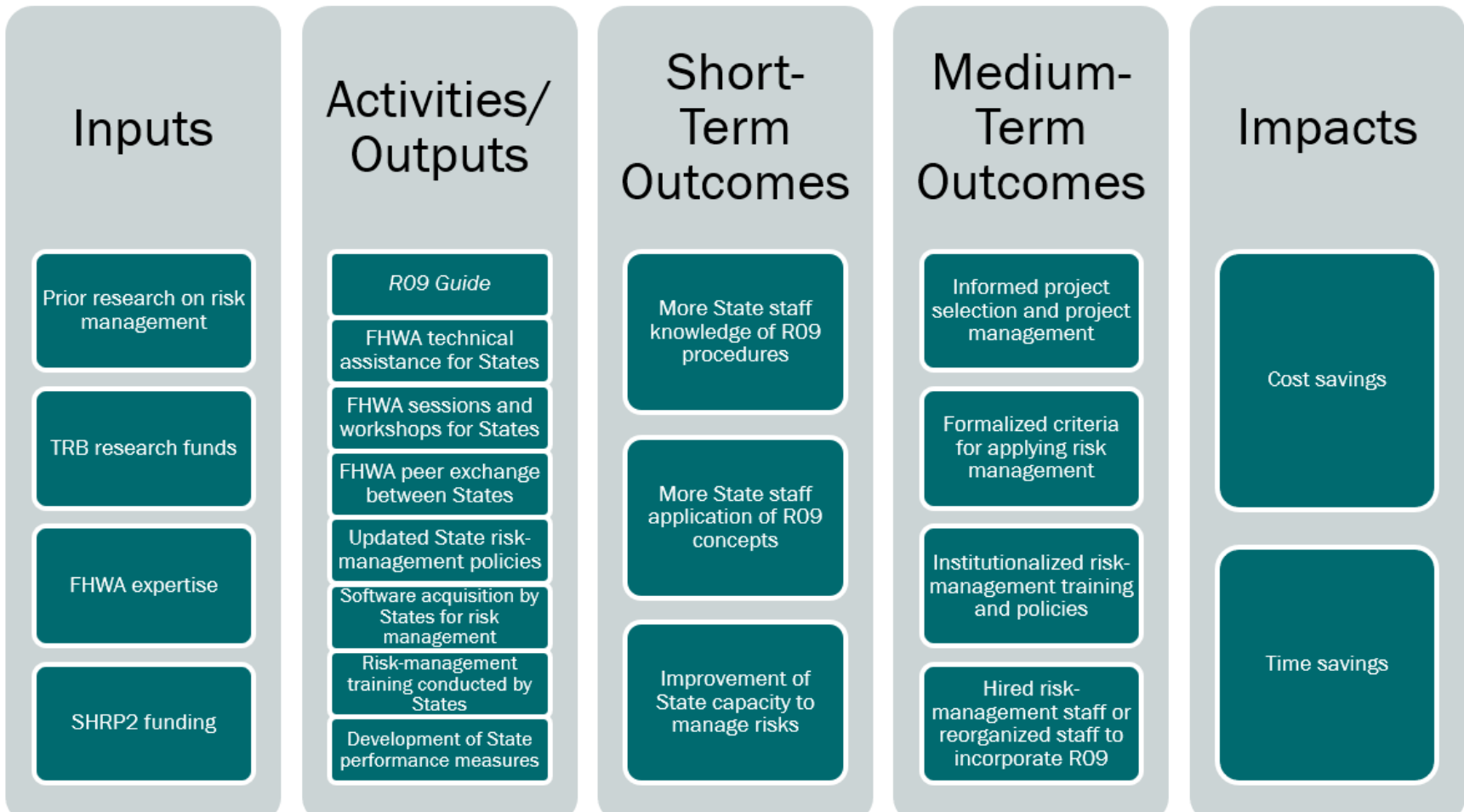
The evaluation team developed a high-level logic model to pinpoint evaluation areas. Through discussions with FHWA staff and a review of program documentation, the evaluation team identified inputs; activities; outputs; short-, medium-, and long-term outcomes; and impacts of the program. Table 2 presents the three evaluation areas: dissemination, adoption, and project delivery.

Table 2. Evaluation areas.

Evaluation Area	Description
Dissemination	Level of exposure that States had to R09 concepts and processes (e.g., training facilitators and other staff, hosting demonstration workshops, and adopting materials in project and risk management).
Adoption	Extent to which States have institutionalized the R09 process and developed a structured method of applying the R09 process.
Project delivery	Early effect of R09 on project-cost and -schedule estimates.

Program evaluations focus on measurable effects of the program in question. A logic model helps outline the structure of a program, linking program inputs to program outputs. The logic model also serves as a starting point for describing the outcomes and what the evaluation intends to measure. For R09, the inputs are relatively straightforward. The *R09 Guide* was developed with funds and insights from TRB, building upon prior research on risk management. Expertise from FHWA and the American Association of State Highway and Transportation Officials (AASHTO) along with SHRP2 funds helped to launch the R09 product and ultimately deliver trainings, demonstration workshops, and materials to States.

Program activities are the key link between the inputs and outputs. For R09, a variety of important activities were undertaken. With the end goal of sharing these risk-management best practices, TRB oversaw development of the *R09 Guide*.⁽²⁾ FHWA then facilitated demonstration workshops for the four lead-adopter States. These workshops were designed to help State transportation departments begin using the improved risk-management process on specific projects and understand the potential cost and schedule savings by implementing this process. For their part, States aimed to develop or update risk-management policies, acquire risk-management software, conduct risk-management trainings, and establish performance metrics to measure the results of improved risk-management processes. Figure 1 presents this evaluation's logic model.



Source: FHWA.

Figure 1. Illustration. Evaluation logic model.

Whereas outputs are typically specific deliverables, outcomes represent desired changes in behavior. For R09, these can be broken down in terms of the expected time frame of effect. In the short term, it is expected that the R09 implementation will enable State staff members to increase their risk-management knowledge, apply R09 concepts, and improve the State transportation department's capacity to manage risks. In the long term, it is expected that the R09 process will have a variety of effects on the actions of State transportation departments. Primarily, it is expected that the R09 process will better inform future project selection, be integrated into States' project-management and -planning documents, and be applied to a wide set of projects.

Impacts are the fundamental, intended changes caused by a program. While these long-term impacts are of great potential interest, they may take many years to manifest. For the purpose of this study, the evaluation team, to the extent possible, investigated cost and schedule improvements, enhancements, or savings on projects that incorporated R09 or risk-management processes.

Given the scope of this evaluation and the early nature of the projects involved, the evaluation focused on the activities of lead-adopter States that occurred during the evaluation timeframe (2013–2017). The qualitative nature of the short-term outcomes necessitated a qualitative evaluation rather than an extensive quantitative data-collection effort. Some quantitative measures (e.g., the number of staff trained and risk workshops given by a State) were collected and analyzed as applicable. Given the relatively small nature of the intervention, more emphasis should be placed on the qualitative assessment of what the States have accomplished as opposed to quantitative claims.

2.3 Evaluation Area 1: Dissemination

Evaluation Question: Did R&T research and SHRP2 implementation assistance increase the capacity within States to disseminate the R09 process?

The primary goal of the *R09 Guide* and associated tools is to enable States and transportation agencies to successfully apply the R09 risk-management process to their projects.⁽²⁾ The first step to attaining this objective is increasing the exposure of State transportation department staff to R09 concepts. FHWA-sponsored demonstration workshops with States provided guidance on specific projects. An additional part of the workshop effort was to “train the facilitators” so that States could conduct their own risk-assessment workshops in the future.

With this evaluation question, the evaluation team aimed to understand the capabilities of lead-adopter staff to conduct risk management, how R09 changed these capabilities, and how much risk-management activity is taking place in each agency.

Evaluation Hypotheses

To determine the extent to which staff in transportation departments of lead-adopter States were exposed to the R09 process, the evaluation team posed two hypotheses. Each hypothesis is measured by a set of metrics, and each metric is an indicator of whether a State has experienced an increased capacity to implement the R09 process.

Hypothesis 1: R&T research and SHRP2 implementation assistance led to an increase in State transportation department staff exposed to R09 risk-management concepts.

Hypothesis 2: R&T research and SHRP2 implementation assistance led to additional risk management–demonstration workshops or training for State transportation department and/or external staff.

The number of staff trained is a primary measure of State transportation departments’ exposure to R09 concepts. Staff trained include facilitators trained in train-the-facilitator trainings as well as those trained through subsequent State-led workshops.

Workshops are a means to implement the R09 process and provide a focused time and set of activities to carefully examine the risks of a particular project. States that are more involved in implementing the R09 process would be expected to host more R09 workshops and apply R09 concepts to other projects.

Table 3 depicts these hypotheses and their information objectives as well as data and measures of effectiveness (MOEs) used to test the hypotheses.

Table 3. Components of evaluation area 1.

Evaluation Hypothesis	Information Objectives	MOEs	Data Source
1: R&T research and SHRP2 implementation assistance led to an increase in State transportation department staff exposed to R09 risk-management concepts.	Determine if the State has more staff trained in risk management than it did prior to receiving SHRP2 implementation assistance.	Number of staff trained to facilitate. Number of staff exposed to R09.	Training documentation and certifications. Interviews with State risk-management staff.
2: R&T research and SHRP2 implementation assistance led to additional risk management–demonstration workshops or training for State transportation department and/or external staff.	Determine if the State held more risk-management workshops or trainings beyond the workshop received with SHRP2 implementation assistance.	Number of workshops held. Number of training events held.	Workshop documents and schedules. Interviews with State risk-management staff.

Analysis Approach

These hypotheses were evaluated through document reviews and interviews with staffs of State transportation departments.¹ Data collected were used to understand the roles, responsibilities, and capabilities of grantee State transportation department staffs who are using R09. These data also helped the evaluation team understand how much risk-analysis activity is taking place.

The amount of risk-analysis activity (e.g., number of workshops, trainings, and participants) varies according to the size of the State and the State’s goals for R09 implementation. It is reasonable to expect less activity in smaller or less-populated States and more in larger or more-populated States.

¹Internal policy documents were provided directly to the evaluation team by State transportation departments and FHWA.

State documentation of all trainings, workshops, or dissemination activities was potentially incomplete or unavailable. With some lead adopters still actively implementing R09, it is possible that some dissemination activities have not yet been documented.

2.4 Evaluation Area 2: Adoption

Evaluation Question: Did R&T research and SHRP2 implementation assistance lead to the adoption of R09 processes within the agency?

It is important to examine whether States have developed a structured method of applying the R09 process. This evaluation question assesses the extent to which State transportation departments institutionalized R09 processes.

Evaluation of Hypotheses

The evaluation team posed three hypotheses on the topic of adoption. Evidence of adoption includes the creation and potentially the implementation of statewide policies and procedures related to R09 risk-management concepts. Each hypothesis is focused on a metric, and each metric is an indicator of whether a State has systematically integrated R09 into its processes.

Hypothesis 3: R&T research and SHRP2 implementation assistance led to the creation of standard guidelines, policy, and criteria for applying the R09 process in States that received implementation assistance.

Hypothesis 4: R&T research and SHRP2 implementation assistance led to the creation of risk management–training procedures for staff.

Hypothesis 5: R&T research and SHRP2 implementation assistance led to additional staff being hired or reorganized to incorporate the R09 process.

States that received a grant and an R09 demonstration workshop would be expected to integrate the R09 process into State policies and eventually apply it to additional projects once the IAP-funded projects are completed. Such a scenario directly depends on any criteria and procedures the States develop in terms of deciding which projects warrant R09-style risk analysis. Table 4 presents these hypotheses and their information objectives as well as data and MOEs to test these hypotheses.

Table 4. Components of evaluation area 2.

Evaluation Hypothesis	Information Objectives	MOEs	Data Source
3: R&T research and SHRP2 implementation assistance led to the creation of standard guidelines, policy, and criteria for applying the R09 process in States that received implementation assistance.	Determine if States have documented criteria or guidelines. Determine if States have integrated R09 into existing policies or guidance. Determine if States use the criteria or guidelines.	State risk-analysis documentation. Project-planning templates. Self-reported use information. Risk-management software.	Interviews with State transportation department risk-management staff. State transportation department risk management-guidance documentation.
4: R&T research and SHRP2 implementation assistance led to the creation of risk management-training procedures for staff.	Determine if States have documented structured training materials. Determine the extent to which States use the training materials (i.e., how many trained how frequently).	State presentation or dissemination materials. Self-reported use information. State records of staff training.	Interviews with State transportation department risk-management staff. State risk management-training documentation.
5: R&T research and SHRP2 implementation assistance led to additional staff being hired or reorganized to incorporate the R09 process.	Determine if States have hired additional staff or reorganized as a result of implementing R09.	Number of staff hired with risk management as a role/responsibility. Presence of reorganization related to risk-management roles.	Interviews with State transportation department risk-management staff. State transportation department organizational charts.

Analysis Approach

Data collection for this evaluation question relied on reviewing internal State documents and discussions with State transportation department staff responsible for conducting risk management.² Therefore, the analysis was primarily qualitative. Any documentation of criteria for applying the R09 process or conducting R09 training was collected. Interviews with State risk-management staff gave context to the documents and helped identify criteria or procedures that may be in draft stages and therefore not reflected in the documentation.

Since R09 adoption is still ongoing for the lead adopters, some documentation was unavailable. Further, the available documentation is subject to change; it is important to consider that some policies and procedures collected may be incomplete or pending updates.

The method and level of adoption varied between States. Some lead adopters developed criteria and procedures that were more tailored to their own business culture and needs; others elected to leverage the materials provided by FHWA.

²Internal policy documents were provided directly to the evaluation team by State transportation departments and FHWA.

2.5 Evaluation Area 3: Project Delivery

Evaluation Question: Is the R09 process improving project delivery within the lead-adopter States?

While earlier questions focused on the implementation of the R09 process, the third evaluation question examined the impact of the R09 process. That is, What effect has FHWA research and SHRP2 funding had on project outcomes?

Evaluation of Hypotheses

The evaluation team posed two hypotheses to examine how R09 affects project outcomes. Areas of interest included cost projections and project-planning timelines.

Hypothesis 6: R&T research and SHRP2 implementation assistance has led to a change in cost projections.

Hypothesis 7: R&T research and SHRP2 implementation assistance has led to a change in timeline projections.

A quantitative analysis of timeline and cost effects of R09 was outside the scope of this evaluation. However, qualitative information gathered from interviews with State transportation department risk-management staff and reviews of project-planning documents provided early indications of the impact R09 processes may have had on projects. Table 5 presents these hypotheses and their information objectives as well as data and MOEs to test these hypotheses.

Table 5. Components of evaluation area 3.

Evaluation Hypothesis	Information Objectives	MOEs	Data Source
6: R&T research and SHRP2 implementation assistance has led to a change in cost projections.	Determine if and to what extent project cost projections changed as a result of implementing R09.	Anecdotal evidence of cost changes.	Interviews with State transportation department risk-management staff.
7: R&T research and SHRP2 implementation assistance has led to a change in timeline projections.	Determine if and to what extent project timeline projections changed as a result of implementing R09.	Anecdotal evidence of timeline changes.	Interviews with State transportation department risk-management staff.

Analysis Approach

Data collection for this evaluation area relied on reviewing internal State documents. Project reports from completed R09 projects were collected and reviewed for relevant data.³

At the time of this evaluation, only one lead-adopter demonstration project was complete—Oregon’s Ochoco Creek Bridge project.⁽⁵⁾ Thus, it was the only project with performance metrics to analyze. All of the other lead-adopter projects were still underway, and many had yet to reach the construction phase. Given the limited data among lead adopters, evaluators reviewed an R09 project completed by the Arizona Department of Transportation (ADOT) at the request of FHWA. Arizona was not a lead adopter but did receive a SHRP2 IAP grant to implement R09 in Round 4. Evaluators used the

³Internal policy documents were provided directly to the evaluation team by States and FHWA.

performance data from Arizona's completed R09 project to supplement the project-delivery area of this evaluation.

Given these limitations, analysis of this evaluation area should be considered a preliminary snapshot of how R09 processes may impact transportation projects.

2.6 Data Collection

Two methods of data collection were employed for this evaluation: archival review and stakeholder interviews. Several documents that were reviewed pertained directly to projects that used R09 processes. Project-planning documents provided useful insights into how States put R09 risk management into practice. State transportation department policy documents formed another major archival category. These documents included agency guidance on risk management, criteria for applying the R09 process, and evidence of R09 workshops or trainings offered. Stakeholder interviews provided context to the information provided in the documents.

Before official data collection began, evaluators held preliminary conversations with lead adopters to identify potential data sources and discuss availability for interviews. At the time of these preliminary conversations, Florida, Pennsylvania, and Oregon were actively engaged in R09 and reported a number of potential sources. Minnesota, on the other hand, reported that it did not proceed with R09 dissemination. Evaluators later confirmed this information during a formal, in-person interview. Minnesota reported that, around the time it was chosen as an R09 lead adopter, it had purchased risk-analysis software that uses a Monte Carlo model simulation. With FHWA approval, Minnesota elected to pursue the full probabilistic risk-analysis (Monte Carlo simulation) paradigm instead of using R09. While Minnesota did not undertake full R09 implementation, this report will discuss some of Minnesota's experiences as points of comparison.

Archival Review

Each lead adopter identified at least one project on which to use R09 risk-management processes using SHRP2 funds. Evaluators collected and reviewed planning and summary documents for these projects. The evaluation also examined State criteria and policy for applying the risk-analysis framework. Documents included State or agency risk-management policies, guidance, and organizational structure, as applicable.

Florida provided progress reports on R09 implementation from 2015⁴ and 2017⁵, implementation plans⁶, a risk-management plan for the Pinellas Gateway project, and a risk register for the Pinellas Gateway project.⁷⁽⁶⁾

⁴Internal document provided via email by Florida Department of Transportation (FDOT).

⁵Internal document provided via email by FDOT.

⁶Internal document provided via email by FDOT.

⁷Internal document provided via email by FDOT.

Minnesota provided an R09 implementation plan⁸, an implementation progress report⁹, an attendance record for demonstration workshops¹⁰, evaluation results of demonstration workshops¹¹, and a proceedings summary from demonstration workshops.⁽⁷⁾

Oregon delivered an R09 implementation plan¹², an implementation progress report¹³, a summary of the proceedings of R09 demonstration workshops¹⁴, evaluation results of R09 demonstration workshops¹⁵, a revised project management–plan guide¹⁶, a revised project business case¹⁷, a revised risk-management framework¹⁸, a memorandum concerning local public agencies¹⁹, an executive briefing-session report²⁰, a revised scope and select framework²¹, a transportation project–lifecycle workflow²², and a postconstruction report on the Ochoco Creek Bridge project.⁽⁵⁾

Pennsylvania included an R09 implementation plan²³, an implementation progress report²⁴, R09 workshop rosters²⁵, evaluation results of R09 workshops²⁶, an executive presentation²⁷, and a summary of demonstration workshop proceedings for the Potters Mills Gap project.⁽⁸⁾

Evaluators collected a limited amount of quantitative data for the dissemination area. Dissemination MOEs included the number of staff trained to facilitate R09, number of additional risk-management workshops held, and number of staff trained in risk management. Rating sheets completed by workshop participants also provided quantitative information on the perceived value and usefulness of the R09 workshops.

Evaluators also collected limited quantitative data for the project-delivery area. Documents that reported projected and actual cost and/or timeline data were collected as evidence of R09 impacts.

Stakeholder Discussions

Evaluators held phone and in-person interviews with seven stakeholders: the four lead-adopter State transportation departments, TRB, and FHWA contractors involved in the development and deployment of R09.

⁸Internal document provided via email by the Minnesota Department of Transportation (MnDOT).

⁹Internal document provided via email by MnDOT.

¹⁰Internal document provided via email by MnDOT.

¹¹Internal document provided via email by MnDOT.

¹²Internal document provided via email by the Oregon Department of Transportation (ODOT).

¹³Internal document provided via email by ODOT.

¹⁴Internal document provided via email by ODOT.

¹⁵Internal documents provided via email by ODOT.

¹⁶Internal document provided via email by ODOT.

¹⁷Internal document provided via email by ODOT.

¹⁸Internal document provided via email by ODOT.

¹⁹Internal document provided via email by ODOT.

²⁰Internal document provided via email by ODOT.

²¹Internal document provided via email by ODOT.

²²Internal document provided via email by ODOT.

²³Internal document provided via email by the Pennsylvania Department of Transportation (PennDOT).

²⁴Internal document provided via email by PennDOT.

²⁵Internal document provided via email by PennDOT.

²⁶Internal document provided via email by PennDOT.

²⁷Internal document provided via email by PennDOT.

The first interviews were held with those involved in creating the R09 products and processes—TRB and two FHWA contractors. These interviews were held over the phone and provided evaluators with some history of the R09 program and the intent behind the R09 process and products.

Most of the interviews with lead adopters were held during the R09 Peer Exchange in Orlando, FL, from January 31 to February 1, 2017.⁽⁹⁾ The peer exchange workshop brought together almost all of the State transportation departments implementing R09; each State was given a platform to share its experience with R09. Evaluators attended all of the State presentations and held private, in-person interviews with the lead-adopter States in attendance. The Oregon Department of Transportation (ODOT) was unable to attend the event in person; its R09 coordinator gave a presentation virtually and was interviewed over the phone 2 weeks after the peer exchange. See table 6 for a detailed timeline of the evaluation interviews held. Please note that interviews occurred during late 2016 and early 2017; as a result, this report may not reflect the most recent updates concerning these States.

Table 6. Timeline of Interviews.

Stakeholder	Role	Interview Time
TRB	Reviewer and manager of R09 research products/results	August 2016
FHWA contractor	Initial technical contractor (development contractor)	October 2016
FHWA contractor	Current technical contractor (deployment contractor)	October 2016
FDOT	Lead-adopter grantee	January 2017
PennDOT	Lead-adopter grantee	February 2017
MnDOT	Lead-adopter grantee	February 2017
ODOT	Lead-adopter grantee	February 2017

FDOT = Florida Department of Transportation; PennDOT = Pennsylvania Department of Transportation; MnDOT = Minnesota Department of Transportation.

3. Evaluation Findings

This chapter presents the results of the evaluation data collection and analysis that pertain to each of the three evaluation areas: dissemination, adoption, and project delivery.

When reading these results, it is important to consider that, during interviews, lead adopters often had difficulty separating R09-specific risk-management processes from other risk-management processes. This is not negative—risk management is important, and a seamless integration of R09 with any other risk-management practices or efforts should be commended. However, such cross-pollination does present an analysis limitation as some of the results below may be influenced by risk-management programs or practices outside R09.

3.1 Dissemination

Evaluation Question: Did R&T research and SHRP2 implementation assistance increase the capacity within States to disseminate the R09 process?

The dissemination area focused on the level of exposure that States had to R09 concepts and processes (e.g., training facilitators, training project managers, and hosting demonstration workshops). Dissemination measures are associated with the shortest-term outcomes of leveraging IAP grants. It is worth noting that State requirements and capacities differ. As a result, one should not assume that certain States disseminated R09 concepts in a “better” way compared to other States. Ultimately, States tailored R09 concepts to their respective requirements.

Hypothesis 1: R&T research and SHRP2 implementation assistance led to an increase in State transportation department staff exposed to R09 risk-management concepts.

According to the authors of the *R09 Guide*, the guide was designed to allow States to ultimately conduct risk-management processes for rapid-renewal projects themselves. One author noted the following:⁽²⁾

“We focused on State [transportation departments] doing it themselves so that we could train staff (a few champions, specialists) to apply this Guidebook to relatively simple projects (bulk of most of their projects). Could use fairly simple techniques.”¹

Lead adopters developed implementation plans that outlined how they would use FHWA funding and assistance to train facilitators and then deploy R09 processes throughout their States.

Finding 1: SHRP2 and FHWA support enabled lead adopters to expose more of their staff to R09 risk-management processes.

Florida used State, FHWA, and SHRP2 resources to train approximately 32 potential facilitators, who subsequently taught R09 concepts to nearly 150 Florida Department of Transportation (FDOT)

¹FHWA contractor. Phone interview conducted by Alison Bisch and Joseph Luna (evaluation team), October 2016.

project managers across FDOT's districts and regions.² Several trainings were conducted with Regional Risk Teams.³ For FDOT, R09 presents one of various tools that can be used to manage risk:

"R09 came out in 2013. Obviously, R09 did not define risk management, it's been around. It's just a tool to help us with risk."⁴

While FDOT has maintained that R09 is one of many risk-management tools available to it, it has conceded that cultural changes are still needed to embed specific risk-management processes. R09 trainings have helped to implement such changes:

"R09 has provided more training than we can take. It was a large group of folks in 2013, [and we had an additional] training last year that helped facilitate a culture change here in Florida. That training reinforces the culture change in the region and the district."⁵

Oregon reported that approximately 20–25 staff members were initially trained on the R09 tool. As described in section 3.2, Oregon is working to customize its version of the R09 tool and has conducted subsequent R09-related trainings for specific projects. Once ODOT customizes its tool, it will train additional staff.⁶

Pennsylvania hosted two R09 train-the-facilitator trainings and two pilot-project workshops with SHRP2 assistance with approximately 40–50 potential facilitators trained. Pennsylvania reported that it intends to offer additional risk-management training and workshops as it disseminates R09 practices to its 11 districts. Prior to R09's deployment, the Pennsylvania Department of Transportation (PennDOT) did not have a risk-management policy from a project-development standpoint. "Good" project managers had always done ad hoc risk management, but there was no process for training newer project managers in risk management. Ultimately, PennDOT aims to have training sessions in all 11 of its districts, focusing on how risk management could be applied to 2–3 specific projects in each district.⁷

In terms of staffs' perceived value of the R09 train-the-facilitator trainings and demonstration workshops, most participants agreed that these events were useful and advanced their knowledge of risk management. However, some respondents criticized the pacing of the workshops and found it difficult to search through the materials provided.⁸

Hypothesis 2: R&T research and SHRP2 implementation assistance led to additional risk-management demonstration workshops or training for State transportation department and/or external staff.

²Representatives for FDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), January 2017.

³Representative for FDOT. Email correspondence provided to Alison Bisch and Joseph Luna (evaluation team), October 2017.

⁴Representative from FDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), January 2017.

⁵Representative from FDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), January 2017.

⁶Representative from ODOT. Phone interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

⁷Representative from PennDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

⁸R09 workshop evaluation materials provided by lead adopters to evaluation team.

There are additional components to implementing the SHRP2 R09 product beyond initially training facilitators and project managers. Given their varied needs and environments, lead-adopter States led R09 workshops that were tailored to local projects. These States also provided workshops to train staff in a variety of specific risk-management concepts and software.

Finding 2: SHRP2 and FHWA support enabled lead adopters to host their own risk-management training/education events.

During the interview with Florida, staff reported hosting nearly 50 risk-analysis workshops throughout the State's 9 districts:

"We do workshops that are not on the radar screen. I conduct them down in [redacted]. We also conduct project-specific workshops when we update our work program every year. [...] We run individual risk workshops on each project."⁹

"We had teleconferences where we took R09, broke it out in modules and every two weeks we'd take a module and train folks around the State. That was taking the R09 structure and exposing [it] to all State regional risk teams."¹⁰

Florida has also conducted, with both State and FHWA/SHRP2 funds, training on risk-response planning (June 2014); risk-analysis, self modeling-tool training (annual); and a risk-response results-analysis workshop (February 2015). FDOT has also hosted statewide knowledge-sharing meetings (October 2014) and a peer exchange with FHWA and AASHTO, bringing together stakeholders and R09 adopters from across the country (January 2017).¹¹ In addition, from August 22–24, 2017, FDOT conducted training on a risk-analysis software package with assistance from SHRP2.

Oregon has hosted at least three demonstration workshops related to the following projects: Interstate 5, South Jefferson–Murder Creek Section; Ochoco Creek Bridge; and US-26, NW 18th Street–Cornelius Pass Road.¹² At these workshops, project staff gained experience developing risk registers and completing risk-mitigation exercises. One staff member noted the following:

"We started with a pilot project, and immediately after that, we had a kickoff meeting. That served as part of roll out. We continued on and did a second pilot project. Between the second and third pilot projects we started a multidisciplinary group with a risk-management framework [...] so that people could adopt risk management throughout the agency in parallel with their activities."¹³

⁹Representatives for FDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), January 2017.

¹⁰Representatives for FDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), January 2017.

¹¹From an internal implementation update document provided by FDOT to evaluation team, October 2017.

¹²Presentation by ODOT at R09 Peer Exchange in Orlando, FL, January 2017.

¹³Representative for ODOT. Phone interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

According to its implementation plan, Oregon has plans to offer R09-related workshops and additional facilitator training sessions online; Oregon wants to offer virtual courses that can reach a decentralized workforce.¹⁴

Pennsylvania hosted demonstration workshops related to two pilot projects: Potters Mills Gap and Cementon Bridge. Some of the activities associated with these pilots included train-the-facilitator training, formation of statewide risk teams, statewide team facilitator training, and drafting policy frameworks.¹⁵ A representative from PennDOT noted the following:

“With Cementon Bridge, it’s very early on in the process. Going through the pilot made them aware that accelerated bridge construction was not the alternative to pick. [...] The R09 analysis brought to light the cemetery issue that we have over there. Because of that they are moving forward with doing some preliminary investigations to see where the boundary of that cemetery is.”¹⁶

While lead adopters conducted R09 workshops tailored to specific projects, they reported that the R09 demonstration workshop was too long.¹⁷ With workshops lasting a whole 2 days, States found it difficult to justify to upper management having staff off the job for that long:

“...I think that practically speaking, for routine projects those [trainings] would be something we could get down to half a day, and that’s a lot more feasible for participation. Very difficult to get out for a one-off thing. [...] If you can condense things down to four hours then that’s quite feasible.”¹⁸

To train more staff, some States began offering shorter versions of the workshop to district teams.¹⁹ FHWA provided 2-day workshops; however, to ensure comprehensive, practical training, the first day of training aimed to familiarize respondents with R09 processes while the second day of training applied R09 to a project to show project-level results.

Table 7 summarizes dissemination findings by State.

¹⁴Internal document provided via email by ODOT.

¹⁵PennDOT presentation at R09 Peer Exchange. Orlando, FL. January 2017.

¹⁶Representative for PennDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

¹⁷Presentations by FDOT and ODOT. R09 Peer Exchange. Orlando, FL. January 2017.

¹⁸Representative for ODOT. Phone interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

¹⁹FHWA has acknowledged this feedback, stating that only the initial demonstration workshop is intended to last 2 days, while subsequent workshops can be held in 1 day.

Table 7. Dissemination findings by State transportation department.

State	Finding
Florida	Trained approximately 32 potential facilitators who then taught R09 concepts to nearly 150 project managers across the State.
Oregon	Trained approximately 20–25 staff members on R09 tool and working to customize tool.
Pennsylvania	Hosted two train-the-facilitator trainings and two project demonstration workshops, with approximately 40–50 potential facilitators trained.
Florida	Hosted nearly 50 risk-analysis workshops throughout its districts.
Florida	Conducted risk-response workshops, knowledge-sharing meetings, and risk-software trainings.
Oregon	Hosted three project demonstration workshops.
Pennsylvania	Hosted two project demonstration workshops.

3.2 Adoption

Evaluation Question: Did R&T research and SHRP2 implementation assistance lead to the adoption of R09 processes within the agency?

The adoption area assesses the extent to which States have institutionalized the R09 process and developed a standardized method of applying the R09 process. This area’s measures are associated with the medium- to long-term outcomes of leveraging IAP grants.

Representatives from the organizations responsible for developing the R09 process and products reported that R09 was designed to cover several areas that are not typically addressed by other risk-management programs. First, the developers intended R09 to be a simple but reliable way to conduct risk management; they wanted anyone on a project staff to be able to take a short training and feel comfortable performing risk management. Second, developers wanted to design a risk-management approach that considers risk at all phases of a project lifecycle—not just the construction phase. One representative commented as follows:

“The biggest thing, people wanted an understanding of what a completed process would look like. This was just a one-day, two-day workshop. [...] People wanted examples of what the product would look like.”²⁰

Last, developers desired a risk-management program that included traffic disruption as a performance metric in addition to the common metrics of cost and time.²¹

Hypothesis 3: R&T research and SHRP2 implementation assistance has led to the creation of standard guidelines, policy, and criteria for applying the R09 process in States that received implementation assistance.

Oregon, Pennsylvania, and Florida all made progress incorporating R09 risk management into their standard procedures. While States initially found the spreadsheet-based risk-management tool

²⁰TRB representative. Phone interview conducted by Alison Bisch and Joseph Luna (evaluation team), August 2016.

²¹Representatives of TRB and FHWA contractors. Phone interviews conducted by Alison Bisch and Joseph Luna (evaluation team), August and October 2016.

difficult and too complex for smaller projects, FHWA listened to their concerns and redesigned the tool. While Minnesota did not move forward with R09, the other three lead-adopter States tailored the tool to their needs and updated their risk-management policies and procedures.

Finding 3: The R09 tool can be too complicated for smaller projects, and staff may not retain proficiency if the tool is not used frequently.

One lead adopter—State employee said the following:

“The feedback was a little mixed. On the first train-the-facilitator session, it was very negative. That tool was hard to work through, user unfriendly, most of us didn’t want to try to train on it because we weren’t comfortable with it.”²²

The Minnesota Department of Transportation (MnDOT), which ultimately chose Monte Carlo simulation software over R09, offered the following perspectives:

“We looked into R09, and we understood it was maybe more of a simplified tool to use instead of full-blown Monte Carlo. If we can get this to project managers on less-complex jobs, this would be a better tool to consider [...] The software we have is easy to use. I crank out full Monte Carlo simulations with full risk register in under an hour, but I couldn’t get through two tabs of R09 in that time.”²³

“...hearing from the FHWA Division Office staff after that the tool was customizable, but that never came out of the workshops we were in. That was a little turnoff moving forward. This just seems way too complicated, that is not what we’re doing, and I don’t know how we get project managers and teams willing to do this.”²⁴

Minnesota ultimately chose an alternative risk-management tool; however, MnDOT representatives noted that much of that decision was institutionalized prior to the roll out of R09 through SHRP2 IAP. At the time of the SHRP2 IAP, MnDOT was already considering other software with Monte Carlo simulation capabilities and, given constraints to staff and time, maintained the initial decision to move forward with the other software.²⁵

The most recent version of the tool (demonstrated at the 2017 Peer Exchange) improves on the original, but it is difficult to retain proficiency if one does not use the tool regularly. Oregon suggested creating a more scalable version of the tool, specifically a version that allows some capabilities of the current tool to be disabled for smaller or less complex projects. At the time of this evaluation, Oregon reported that it had started creating a customized, scalable version of the R09 tool:

²²Representative of PennDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

²³Representatives of MnDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

²⁴Representatives of MnDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

²⁵Representatives of MnDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

“Our folks said it was really complex and way easy to get it wrong. We’re looking at trying to make adjustments to come up with an Oregon version of the tool to make it less challenging for people to pick up and use.”²⁶

Pennsylvania echoed these concerns that the tool is too complex for some smaller projects. Instead of trying to scale the tool, Pennsylvania elected to employ a tiered approach based on project complexity and cost. Such an approach would determine whether a project should use an R09-based tool for risk management.²⁷

Despite initial setbacks with the R09 tool, lead-adopter States were ultimately able to incorporate R09 processes into their risk-management policies.

Finding 4: R09 influenced lead adopters to incorporate risk management into their standard policies, processes, and procedures.

Oregon shared five documents that demonstrate how R09 risk-management processes and concepts have been woven into ODOT policy and guidance:

- **Project Business Case and Scope and Select Phase:** Guidance to help staff develop early planning documents that inform and validate the decision to pursue a project. Both documents encourage planners to identify and document potential risks before a project is selected.^(10,11)
- **Transportation Project Lifecycle Work Flow and Role Definitions:** Document to help staff think through the entire lifecycle of a project and who will be involved at various stages; the workflow diagram offers a high-level, visual summary of the project, including when risk-management activities will take place.⁽¹²⁾
- **Project Management Plan (PMP):** Guide that describes a formal process to manage, execute, and control ODOT projects. PMPs should describe how risks will be identified, documented, and handled. The PMP also recommends that staff use a risk register.⁽¹³⁾
- **Risk Management—All Project Phases:** Framework that explains the overall process of risk management and delves into how risk management evolves throughout the project lifecycle. The framework provides resources for brainstorming risks in a given project phase and provides a means for selecting beneficial risk-management tools based on project characteristics and complexity.⁽¹⁴⁾

Oregon also reported that it is developing a customized version of the R09 tool—one that is scalable and reflects the needs for less-complex projects in Oregon.

Pennsylvania has adopted R09 processes using a tiered approach. This approach uses thresholds based on project complexity and cost. Pennsylvania reported that staff is required to use risk-management principles on all projects, but only large, complex projects are required to use the R09 tool and more robust risk-management processes. A PennDOT representative said the following:

²⁶Representative of ODOT. Phone interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

²⁷Representative of PennDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

“It had to be rolled into existing systems; we did not want to add extra complexity. [...] We wanted to be able to make people more responsible for the risks. Right now, the way we do projects, the project manager really is holding the ball for everything. If something pops up, they’re responsible. The way we’re doing it [post-R09], the project manager is still responsible, but there’s a person responsible for each individual risk [...] we want to spread it out to the team.”²⁸

PennDOT organized a statewide team to develop policies and procedures for the risk-management tools/resources the agency has acquired. One of those materials is the *Risk Management for Project Development* document—a guide that clearly states its contents are inspired by the *R09 Guide* and a similar guide from the California Department of Transportation.^(15,2,16) This guide emphasizes scalability in risk management, proposing different risk-management strategies depending on the characteristics and complexity of a given project. It also outlines risk-management roles and responsibilities of project staff, describes how to integrate risk management at various project phases, and introduces helpful risk-management tools (e.g., risk registers, R09 tool, and Pennsylvania’s own risk tool).

Pennsylvania has revised its PennDOT Connects form—a scoping questionnaire for project planners and managers—to incorporate R09 risk-management elements.⁽¹⁷⁾ The goal is to enhance this questionnaire to get people to think about schedule and budget risks. Additionally, PennDOT revised its project-risk register to incorporate R09 concepts.²⁹

Florida is actively engaged in updating its policy and procedures to incorporate R09 concepts. Historically, risk assessment for FDOT projects took long periods of time as noted by one staff member:

“...in the districts we’d have meetings where production director would go through projects one at a time, go through all the risks. If there was a utility issue, he’d look at the utility engineer. Or look at the environmental permitting folks. Some of the early ones, the production director would make people cry. Some districts would take two days.”³⁰

To expedite future risk management, FDOT is implementing a new policy mandate for risk-based project contingencies and updating existing documents, such as its *Project Management Handbook*.³¹ FDOT particularly appreciated the risk register developed through R09 and notes that such a practice is vital to ensuring project continuity should there be staffing changes:

“...risk register is something to work on. R09 can do that—I don’t think we have other software to do that [...] a lot of DOT [departments of transportation] folks will be leaving. The risk register will capture what is going on.”³²

Florida has also recently purchased risk-analysis software. Acquisition of this software demonstrates the State’s customized adoption of risk management. FDOT plans to conduct additional R09-related

²⁸Representative of PennDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

²⁹Risk register provided by PennDOT via email to evaluation team.

³⁰Representative from FDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), January 2017.

³¹At the time of writing this report, FDOT was still updating this handbook.

³²Representative of FDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), January 2017.

trainings in the future, namely on risk-analysis modeling, risk-management software, long range-estimating systems, and design-quantity estimation.

Finding 5: R09 encourages users to assess and address risk throughout the project lifecycle.

States appreciated that R09 emphasized the use of risk management in various project phases—not just during construction. Oregon’s policy documents demonstrate that ODOT is imploring staff to use risk-management practices throughout the project lifecycle. Oregon’s *Transportation Project Lifecycle Work Flow and Role Definitions* is a good example; it contains a workflow diagram with risk management represented during project initiation, planning, execution, and closeout.⁽¹²⁾ Further, Oregon’s *Ochoco Creek Post Risk Management Workshop/Construction Review* reports the benefits of the R09 risk-management process; in particular, it views risk management as an iterative process.⁽⁵⁾

Similar to Oregon, Pennsylvania’s *Risk Management for Project Development* guidance document emphasizes the importance of integrating risk-management practices throughout the project lifecycle.⁽¹⁵⁾ The risk register, in particular, should be maintained and monitored throughout the project lifecycle to realize the greatest benefit.³³

Finding 6: R09 encourages a broad set of users to participate in risk management.

Oregon incorporated a broad set of stakeholders to help identify and manage risks during R09 workshops. For the SHRP2 R09 demonstration workshop for the Ochoco Creek Bridge replacement, ODOT invited local stakeholders and independent subject-matter experts.⁽¹⁸⁾ As one staff member noted, their participation was crucial to building community trust and engagement:³⁴

“The other piece of feedback I don’t want to neglect from workshops is that we got really great feedback related to the whole process around the stakeholder group [...] In the case of workshop 2, we brought in a lot of local stakeholders. Great feedback on utility of having folks at table broadly in these discussions. Lots of value found in that.”³⁵

Oregon is continuing to engage with local public agencies (LPAs). Because LPAs ultimately own risks and risk decisions for local projects, it is in the State’s interest for LPAs to use appropriate risk-management procedures. While ODOT cannot mandate that LPAs use certain risk-management tools, ODOT can provide guidance and best practices to LPAs.³⁶

Hypothesis 4: R&T research and SHRP2 implementation assistance has led to the creation of risk management-training procedures for staff.

Pennsylvania, Florida, and Oregon have all reported efforts to develop risk-management training that meets their respective needs. However, simply developing risk-management training does not mean a procedure to train staff has been created. To create such a procedure, institutional stagnation must be overcome and support from upper management must be obtained. Lead adopters also

³³Internal correspondence between FHWA and Joseph Luna (evaluation team), February 2018.

³⁴Presentation from ODOT and R09 Peer Exchange. Orlando, FL. January 2017.

³⁵Representative from ODOT. Phone interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

³⁶Internal ODOT document (Local Program Leadership Team Advisory) provided by ODOT to evaluation team, June 2017.

reported that gaining buy-in from staff can be difficult as some are resistant to changing project-management habits. Further, high turnover and frequent internal movement within the State transportation departments result in the need to constantly educate staff about the merits of risk management. Staff from these State transportation departments commented as follows:

“This isn’t quick. Getting risk management to be adopted [...] this isn’t a kind of short-term effort.”³⁷

“One of our big challenges is convincing management that this is worth the effort. That’s why we’re looking to FHWA to help with the return on investment [ROI] on the project as well as performance measures.”³⁸

“Getting acceptance is probably our largest challenge. We’ve had a lot of good luck presenting it to our Secretary and presentations to district executives for design. They’re on board with the concept. We haven’t rolled out any details on how to actually do that.”³⁹

Finding 7: It is easier to adopt new processes, like R09 risk management, with strong support from upper management.

All three States reported that getting leadership to approve paying for risk-management activities can be difficult, especially because the return on investment (ROI) is not always obvious. Oregon used R09 technical assistance funding to hold an executive briefing session with leadership in hopes of gaining more support. The report from this briefing indicates the session was held in the early stages of Oregon’s participation as an R09 lead adopter; it describes the need for a holistic approach to risk management and brings attention to the R09 program. Oregon reported that briefings like this need to be repeated for leadership to keep supporting risk management. Pennsylvania also held a similar briefing session to garner and maintain support from its upper management.

Hypothesis 5: R&T research and SHRP2 implementation assistance has led to additional staff being hired or reorganized to incorporate the R09 process.

During interviews, none of the lead adopters reported hiring new staff to assume risk-management roles. Lead adopters also did not perform any official reorganizations; current staff were not reassigned or given new titles to reflect new risk-management roles and responsibilities.

Finding 8: Lead adopters did not acquire additional staff or designate staff into official risk-management positions.

³⁷Representative from ODOT. Phone interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

³⁸Representative for FDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), January 2017.

³⁹Representative for PennDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), February 2017.

For several lead-adopter States, budget constraints coupled with staff attrition limited transportation departments’ abilities to add or reorganize staff specifically for risk management. FDOT staff commented as follows:

“No, that’s a sore spot. We had 20,000 [staff] before, but now we have only 5,000. It’s a challenge [...] State workers haven’t received pay raises in six years.”⁴⁰

However, lead adopters did ask their staffs to actively participate in and take ownership of risk management. In Pennsylvania, for instance, each district has a risk-management coordinator, which is a collateral duty that has been taken on by many project managers.⁴¹ As mentioned under hypothesis 3, Florida is using R09-influenced risk registers to ensure that, when staff do leave, new project managers can quickly understand a project’s risks to maintain project continuity.

Table 8 summarizes R09 Adoption findings by State.

Table 8. Adoption findings by State transportation department.

State	Finding
Minnesota	Implemented alternative software package that incorporated Monte Carlo simulation, based on prior decisionmaking.
Oregon	Creating customized, scalable version of R09 template.
Pennsylvania	Employing tiered risk-management approach based on project complexity and cost.
Pennsylvania	Developed <i>Risk Management for Project Development</i> document and revised PennDOT Connects form to incorporate R09 risk-management elements.
Florida	Updated Florida Project Management Handbook and purchased risk-analysis software.
Oregon	Encouraged staff to use risk-management principles throughout the project lifecycle.
Pennsylvania	Emphasized to staff the importance of integrating risk-management practices throughout project lifecycle.
Oregon	Incorporated a broad set of stakeholders to help identify and manage risks during R09 workshops.
Florida, Pennsylvania, Oregon	Creating risk-management trainings to meet their needs, despite institutional inertia and difficulties securing support from upper management.
Pennsylvania, Oregon	Held executive briefing sessions to help secure support of upper management for risk-management adoption.
Florida, Pennsylvania, Oregon	New staff were not hired to specifically support risk management.
Pennsylvania	Designated district risk-management coordinators, which were often project managers performing collateral duties.
Florida	Using R09-influenced risk registers to ensure project continuity, given staff attrition.

⁴⁰Representatives from FDOT. Interview conducted by Alison Bisch and Joseph Luna (evaluation team), January 2017.

⁴¹Internal correspondence between FHWA and Joseph Luna (evaluation team), February 2018.

3.3 Project Delivery

Evaluation Question: Is the R09 process improving project delivery within the lead-adopter States?

The project-delivery evaluation area examines the early effect of R09 on project-cost and -schedule estimates. Project-delivery measures are associated with the impacts of the SHRP2 R09 IAP.

Oregon is using R09 on three projects: one large project and two mid-sized projects. Pennsylvania is using R09 on two projects and Florida on one. Lead adopters attest that R09 has provided value, but most do not yet have data to support this claim.

Oregon is the only lead adopter with a complete demonstration project, the Ochoco Creek Bridge; thus, it is the only lead adopter with any measured performance metrics. To supplement the analysis of project delivery, evaluators reviewed data from an R09 project completed by ADOT—a Round 4 SHRP2 IAP grant recipient.

One of the most common pieces of feedback from the lead adopters was praise for the process of building a risk register. The R09 process of building a risk register calls for project staff and technical experts from all disciplines to help identify risks and take ownership of managing them. Oregon found value in including local and city stakeholders in this process as well. Lead adopters reported that this inclusive process not only resulted in a more comprehensive set of risks and risk-mitigation opportunities, but also encouraged everyone to participate in the risk-management process, which can facilitate continuity in case of staff attrition. The *Ochoco Creek Post Risk Management Workshop/Construction Review* from Oregon specifically lauded the benefits of the risk-register process.⁽⁵⁾

Hypothesis 6: R&T research and SHRP2 implementation assistance has led to a change in cost projections.

Oregon and Arizona both realized cost savings as a result of applying R09 risk-management procedures.

Finding 9: Applying R09 processes can result in improved estimates of project budgets and project cost savings.

ODOT provided the post-risk-management-workshop/construction review of its Ochoco Creek Bridge project.⁽⁵⁾ This review summarized outcomes and lessons learned from using R09 and discussed the effect of implementing formalized risk management on this project's cost and schedule.

In November 2014, ODOT hosted a SHRP2 R09 Risk Management Demonstration Workshop with ODOT staff and stakeholders concerning the Ochoco Creek Bridge project. The workshop identified and prioritized threats and opportunities and listed potential mitigation strategies and their impacts on project performance. Ultimately, stakeholders selected an Accelerated Bridge Construction option based on considerations of cost, traffic, and disruption. Construction was completed in December 2016. This project was initially estimated just over \$2 million. At completion, it cost just under \$2 million despite three contract change orders. When comparing the actual project cost with the anticipated unmitigated cost, ODOT realized cost and schedule savings of approximately \$600,000. The workshop proved instrumental in clarifying risks and ensuring stakeholder buy-in:

“All stakeholders bought into decisions following the [November 2014] workshop and proceeded to deliver the project based on the agreed-upon approach at the workshop. The project team did not have to second guess themselves and did not keep revisiting their decisions. [...] Workshop participation helped achieve buy in from all stakeholders that lasted throughout the development of the project. The R09 workshop provided a formal process that drove everyone to answers that did not have to be revisited during the remainder of project development.”⁽⁵⁾

Arizona provided the risk-management postconstruction meeting report of its US-60/Bell Road Interchange project.⁽¹⁹⁾ This report summarizes the impact of formalized risk management on project cost and schedule.

In December 2014, ADOT hosted a SHRP2 R09 risk-management workshop specific to the US-60/Bell Road project. This workshop identified a total of 50 threats and opportunities pertaining to the project. Similar to Oregon’s emphasis on local engagement, the ADOT project team met with local business owners who would be affected by the project and the road closure to discuss the risks. In conjunction with these local stakeholders, the project team decided to implement a construction option that would entail a road closure with more disruption but a shorter construction duration instead of keeping the road open, which would require a longer construction period. The workshop’s unmitigated estimated cost was \$60.7 million, which excluded contingencies and mitigations. By project completion in January 2017, the total project cost amounted to \$49.8 million, including 18 change orders and contingencies, indicating significant project cost savings.⁽¹⁹⁾

Hypothesis 7: R&T research and SHRP2 implementation assistance has led to a change in timeline projections.

In addition to project cost savings, both Oregon and Arizona realized project time savings as a result of applying R09 processes.

Finding 10: Applying R09 processes can result in enhanced project delivery and schedule savings.

Oregon’s *Post Risk Management Workshop/Construction Review* of Ochoco Creek reported construction duration was estimated to be 6 months. However, the actual construction duration lasted 2 days short of 5 months.⁽⁵⁾

Arizona’s *Risk Management Post Construction Meeting Report* of the US-60/Bell Road Interchange project reported that the construction duration was initially estimated at 24 months. Construction actually lasted 14 months. This 10-month time savings—the difference between the initial estimate and the actual duration—resulted in approximately \$1.6 million in savings in construction engineering and inspection costs.⁽¹⁹⁾

Table 9 summarizes project-delivery findings by State.

Table 9. Project-delivery findings by State transportation department.

State	Finding
Oregon	Hosted R09 risk management–demonstration workshop for Ochoco Creek Bridge project, in which a broad array of stakeholders identified, prioritized risks (threats and opportunities), and listed potential mitigation strategies.
Arizona	Hosted R09 risk-management workshop for US-60/Bell Road project, which identified 50 risks (threats and opportunities); ADOT also reached out to local businesses to discuss risks and decide on a construction staging option.
Oregon	Realized project cost savings of approximately \$600,000 and schedule savings of approximately 1 month.
Arizona	Realized project construction and engineering/inspection cost savings of approximately \$1.6 million and schedule savings of 10 months.

4. Recommendations

With SHRP2 coming to a close, the following recommendations are intended for two primary audiences: State risk-management champions who are considering implementing risk-management programs (whether similar to R09 or not) and architects of future strategic highway-research programs.

4.1 Secure Upper-Management Support

As mentioned in section 3.2, implementing a new risk-management program—or, as is often the case, many programs—is a long-term process that requires support from upper management and political officials. Often, there is institutional inertia that may prevent new, untested ideas from being implemented. For many States, budgetary and staff constraints heighten the risk and potential cost of implementing innovative programs.

Recommendation 1: Anticipate the need for upper-management and political support to implement a risk-management program.

Several lead-adopter States recognized the need to secure support from upper management to facilitate implementation of R09 and other risk-management processes. Oregon and Pennsylvania created executive-level presentations highlighting the benefits of R09 and related risk-management processes. With limited State resources, it is critical to frequently remind decisionmakers of programs that generate time and cost savings.

For States considering adoption of innovative risk-management techniques and that lack prior experience, connecting with R09 lead adopters or other adopters through workshops, peer exchanges, and even informal mechanisms can provide the evidence needed to convince upper management. Future risk-management champions should also consider how to define performance metrics and ROI for their proposed risk-management program; having such information ready and easily digestible can improve the likelihood of securing the support of upper management and political decisionmakers.

4.2 Ensure Local Engagement

Transportation-infrastructure projects can generate many local externalities that would affect a broad array of stakeholders. Such stakeholders, if not properly consulted, can organize opposition to a project, ultimately increasing its cost or eliminating it entirely. Recognizing this risk, lead adopters—Oregon, in particular—focused on engaging local agencies and stakeholders in prioritizing risks and identifying appropriate mitigation strategies.

Recommendation 2: Engage local stakeholders in prioritizing risks and identifying mitigation strategies.

Many stakeholders appreciate simply having their concerns heard; such acceptance of feedback is vital to securing support and trust. Establishing a pattern of local engagement can facilitate risk identification and mitigation on future projects.

4.3 Support Project Continuity

Many States face challenges with staff attrition and hiring freezes, which limits the number of staff available for projects and potentially causes interruptions to project timelines. Given the importance of managing risks on rapid-renewal projects, it is essential that States and local transportation agencies establish procedures to ensure project continuity in case of management and staff turnover.

Recommendation 3: Establish processes to ensure that project risks are continually managed, even with staff turnover.

Lead-adopter States—Florida, in particular—lauded the risk register–workshop procedure established by R09. As mentioned in section 3.2, FDOT found risk registers useful for onboarding new managers inheriting projects as staff have left the organization.

4.4 Customize Tools

Ultimately, the success of a risk-management program—whether R09-based or not—depends on the agency’s ability to customize tools and trainings to its needs.

Recommendation 4: States should customize risk-management tools to their specific needs.

Many lead adopters noted that R09 was a difficult tool to use at the beginning; it was too complex for smaller projects and took too much time. Minnesota chose to implement a Monte Carlo–based software solution that it could customize, while Florida, Oregon, and Pennsylvania (along with other R09 adoptees) are currently customizing R09 and other risk-template tools to fit their needs. As shown in section 3.3, Oregon and Arizona both realized project cost and time savings as a result of applying R09 processes to their respective projects.

5. Conclusions

This evaluation report examined the experiences of lead-adopter State transportation departments implementing the SHRP2 product, R09. This report's findings and recommendations are particularly targeted to States and local transportation departments considering adoption of innovative risk-management procedures for rapid-renewal projects and to architects of future highway-research programs.

Of the four R09 lead-adopter States from Round 2 of the SHRP2 IAP, three—Florida, Oregon, and Pennsylvania—implemented R09 and incorporated R09 concepts into their standard policies and procedures. A fourth lead-adopter State, Minnesota, decided to forgo R09 adoption in favor of software with Monte Carlo-simulation capabilities that had previously been considered.

With SHRP2, FHWA, and AASHTO support, Florida, Oregon, and Pennsylvania succeeded in disseminating R09 risk-management processes. These States exposed more of their staff to risk management and hosted their own risk-management workshops and trainings. Some States, however, felt the initial demonstration workshops were too long for long-term dissemination. Lead adopters also reported that proficiency in the R09 tool can be difficult to retain if it is used infrequently and that the tool can be too complicated for smaller projects.

Lead adopters have also been successful in adopting R09 processes. All three States are incorporating risk management into their standard policies, processes, and procedures. Some have started creating their own risk-management trainings based on R09. While States have changed these policies and procedures, none of the lead-adopter States hired (or reorganized) new risk-management staff, namely as a result of budget constraints and staff attrition. However, lead adopters have encouraged a broader array of staff to take ownership of risk management, and R09-inspired risk registers are being used to ensure project continuity.

While it was too early to conduct a robust assessment of project cost and time savings, Oregon and Arizona (a SHRP2 IAP Round 4 R09 adopter) reported time and cost savings to projects as a result of R09 engagement.

Moving forward, States considering adoption of innovative risk-management solutions for rapid-renewal projects could benefit from several lessons learned by the Round 2 lead adopters:

- Given institutional inertia and the risks associated with adopting innovative programs, risk-management champions should secure upper-management and political support as early as possible. These champions should also maintain that support through periodic briefings.
- Beyond management and political support, it is also crucial to engage local stakeholders in prioritizing risks and identifying mitigation strategies.
- With staff turnover being a major risk, States must establish processes such as consistent development of risk registers to ensure seamless management of project risks.
- Regardless of the risk-management tools ultimately implemented, States and local transportation agencies should ensure that such tools and trainings can be customized to their needs.

Appendix. State Interview Guide

FHWA Managing Risk Interview Questions (Florida, Oregon, Pennsylvania DOTs)

9 November 2016

- *Good morning (afternoon), and thank you for your time. My name is _____, and I am reviewing the program, “Managing Risk in Rapid Renewal Projects”, that is, the R09 program. Your participation today will help us understand the successes and shortcomings of R09. As part of this interview, I will ask questions that pertain to you and your agency, as a whole.*

Let’s start with some questions about your role and the early stages of R09 implementation.

1. Would you briefly describe your responsibilities overseeing the risk management implementation?
 - a. Is there a title associated with this role? (manager, or State-risk engineer?)
2. Overall, what responsibilities do State DOT staff have in terms of risk management?
3. How would you describe your State’s risk management practices prior to R09?
4. What were your State’s goals in implementing R09?
5. Would you tell me about how your State has “rolled out” the R09 program?
 - a. About how many R09 workshops have been held?
 - b. About how many R09 trainers—that is, facilitators—have been trained at these workshops?
 - c. About how many training materials were produced by your State DOT for this program?

PROBE: What are some examples of these training materials?
 - d. Ultimately, what proportion of staff have been trained in R09 concepts?
6. How would you characterize the feedback received from facilitators who attended “train-the-facilitator” trainings?
 - a. What about feedback from staff who attended any other R09 trainings in your State?

Now I’d like to get your thoughts on the usefulness of R09.

7. Would you say that the R09 products and processes have been useful to the projects they have been applied to?

PROBE: And why would you say that?

8. What specific aspects of R09 have been the most useful? Please, explain.

PROBE: Least useful?

I'd now like to hear more about how FHWA's R09 program influenced attitudes toward risk management and adoption of new practices.

9. Thinking about your State DOT, would you say that attitudes toward risk management have changed as a result of R09?

a. (If yes) How have attitudes changed?

10. Has your State DOT adopted new risk-management practices as a result of R09?

a. (If yes)

i. Would you tell me a bit more about these new practices?

ii. Are there formal policies or procedures in place driving these practices?

iii. Have new documents, such as guidelines for risk-management execution, been created?

iv. Have new risk-management training procedures been created for staff?

11. Has your State hired more staff to incorporate the R09 process?

12. Have any existing staff been reorganized or assigned specific roles to incorporate the R09 process?

13. About how many projects have applied or are currently applying R09 risk-management processes?

PROBE: Can you describe some of these projects?

PROBE: How many other ongoing projects are not applying R09 risk-management processes?

14. Would you say that project cost projections, or the method for making cost projections, have changed as a result of R09?

15. Similarly, have project timeline projections, or the methods for making timeline projections, changed as a result of R09?

16. Can you think of a project that is similar to one you just listed, but does not use R09 techniques?

a. (If yes)

i. How would the cost projections differ between those two projects?

ii. And how might the timeline projections differ?

iii. Are there any other decisions that might differ between those projects?

17. Are there risk-management techniques that you now apply as a result of the R09 program, or is that not the case?

I'd now like to hear more about the factors that affected adoption of the R09 program.

18. Were there any factors outside of FHWA and R09 that affected your State's adoption of the R09 program?

a. (If yes) Would you tell me more about those factors?

19. Is there anything that your State should have done differently when implementing the R09 program?

a. Do you have any recommendations for other managers of risk-management implementation?

We have now reached the end of our interview. Before I leave, is there anything else you'd like to add?

Thank you for your time today. Your responses have been very helpful in this review. If you have any questions or comments, please feel free to contact us.

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