SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD

SHRP2 R10 Case Studies

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R10 Case Studies

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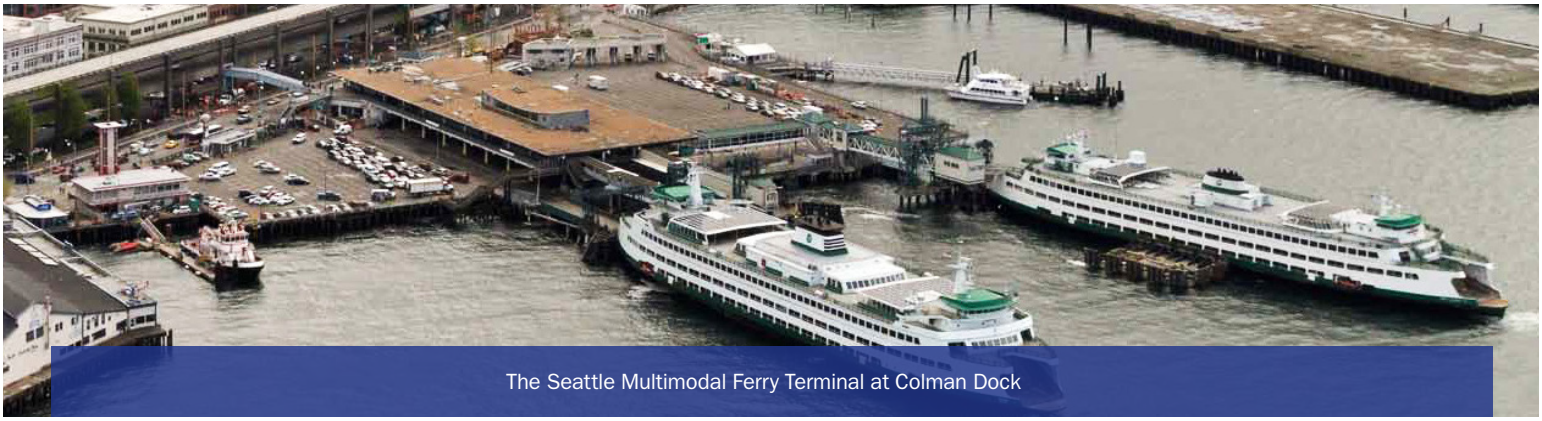
Washington State Department of Transportation: Complex Multimodal Ferry Terminal Replacement Case Study



The Seattle Multimodal Ferry Terminal at Colman Dock

Project Management Strategies for Complex Projects: The Seattle Multimodal Ferry Terminal at Colman Dock Project

The Washington State Department of Transportation (WSDOT) is working with a diverse set of partners and stakeholders as it replaces and reconfigures the aging Seattle Multimodal Ferry Terminal at Colman Dock, all while the terminal remains operational. This multimodal ferry terminal is the largest in the system, providing two service routes to over 8.5 million people annually. The facility also serves two passenger-only routes operated by King County. Pedestrians and bicyclists, as well as several types of vehicles use the terminal, including cars, high occupancy vehicles, and transit.

To facilitate effective project planning and execution, WSDOT is using a product developed through the second Strategic Highway Research Program (SHRP2), called *Project Management Strategies for Complex Projects (R10).* The product provides a systematic and collaborative approach that goes beyond traditional project management methods. It accelerates decision making, addresses complex issues, and expedites project delivery. The product has helped WSDOT assess the project and address complex issues such as public safety, environmental protection, and stakeholder impacts and concerns, from the planning stages through delivery.

Figure 1

Project Snapshot: The Seattle Multimodal Ferry Terminal at Colman Dock Project

- Downtown Seattle ferry terminal with two routes (see map), providing trips across Puget Sound to Kitsap County and the Olympic Peninsula
- Rebuilt in 1964 while retaining many of the original 1938 timber piles, and expanded again in 1992
- Over 8.5 million riders, including 4.5 million foot passengers in 2013; ridership is projected to increase by 39% for the Seattle/Bainbridge route and 25% for the Seattle/Bremerton route by 2030
- Current condition is poor due to aging and seismically deficient timber piers
- $268M project budget
- Key project features: replace main ferry terminal building and passenger-only ferry facility on southern edge of dock; replace and reconfigure portion of the dock to improve safety and operations for vehicles and pedestrian traffic; replace two movable bridges
- General Contractor/Construction Manager (GC/CM) project delivery method
- Six year anticipated construction period: 2017–2023

The SHRP2 Solution: Project Management Strategies for Complex Projects

Project Management Strategies for Complex Projects was the tenth research project in the SHRP2 Renewal Focus Area and is also known as Renewal 10 (R10). The R10 product guides project teams through five dimensions of project management (5DPM): cost, schedule, technical requirements, finance, and context, expanding on the traditional three-dimensional process (cost, schedule, technical requirements). Using R10's planning methods and execution tools, WSDOT (1) quantified the level of complexity in each of the five dimensions of the Seattle Multimodal Ferry Terminal project, (2) applied the planning methods to the most complex areas, and (3) developed action plans and identified potential execution tools to address complexities.

A key benefit of this product is that project managers can apply it to highway projects of varying sizes and types. This characteristic allows project managers to proactively and effectively identify project complexities and develop action plans to determine rational resource allocations and guide project planning and implementation. Furthermore, the 5DPM process may be repeated periodically throughout the project lifecycle to continually monitor complexity and re-allocate resources as necessary.

To learn more, visit : **www.fhwa.dot.gov/GoSHRP2/Solutions/Renewal/R10** or contact Carlos F. Figueroa, P.E. at **carlos.figueroa@dot.gov.**

The R10 Washington State Demonstration Workshop

WSDOT's Colman Dock project team applied *Project Management Strategies for Complex Projects* during a demonstration workshop. The Federal Highway Administration (FHWA) hosted the workshop in order to:

- Showcase the product and provide assistance to WSDOT in applying the product's tools and methods.
- Facilitate project team communication and identify project complexities.
- Identify opportunities to implement complex project management strategies in the delivery of WSDOT's transportation program.

Through the R10 workshop, the WSDOT team learned to effectively identify and address issues earlier in the project's development, and determined to conduct a second project risk assessment including an evaluation of the context issues that could impact the project. The workshop also helped WSDOT better understand the complex stakeholder landscape by bringing to the table at an early stage representatives from FHWA, Federal Transit Administration (FTA), Washington State Ferries (WSF), and the design consultant.

THE WSDOT WORKSHOP TIMELINE

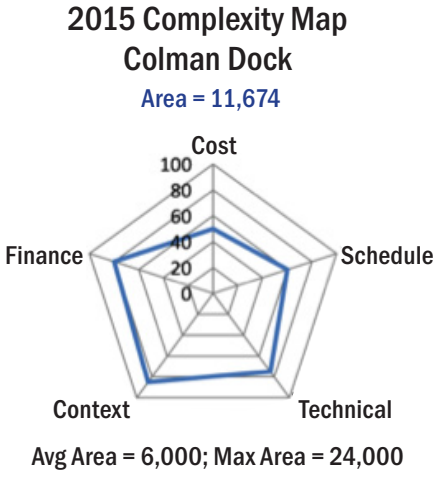
1 — 2 — 3

1 Mapping the Project's Complexity

The Ferry Terminal at Colman Dock is a multimodal hub that serves and affects a variety of stakeholders. This is one of the factors that influences the success of this complex project. Using the R10 process, the WSDOT team identified other success factors within each of the **five dimensions of project management (5DPM):** cost, schedule, technical, finance, and context. Then they quantified the level of complexity for each dimension on a scale of 0 to 100, with 100 representing the greatest possible complexity and 50 representing an average level. The team plotted each dimension's relative level of complexity on a pentagon-shaped graph that provided an overall complexity area rating of 11,674. This graph, shown in Figure 2, is a tool to visualize the 5DPM complexity as determined by the project team. A maximum possible rating area is 24,000 (if all five dimensions are rated 100) and an average rating area is 6,000 (if all five dimensions are rated 50). The team identified the following dimensions as significantly more complex:

- **Context** (Complexity Score of 85) – Specific factors that make context the most complex project dimension include:
  - Limited construction time frame in the water due to seasonal windows for regional fish spawning
  - The need for legislative support and environmental clearance to pursue construction
  - The challenges of coordinating with many significant and influential stakeholders, including the general public, tribal communities, and legislative, political, and environmental regulatory agencies
- **Finance** (Complexity Score of 80) – Specific factors that make finance a complex dimension include:
  - Project funding comes from multiple stakeholders—including FHWA, FTA, WSDOT, King County, and other local sources—and will require a firm understanding of revenue availability from all sources.
- **Technical** (Complexity Score of 75) – Specific factors that make the technical dimension complex include:
  - The challenge of maintaining safe operations and capacity for pedestrian, bicycle, and vehicular traffic, including Americans with Disabilities Act (ADA) access, during construction
  - Adherence to environmental requirements, such as fish-spawning windows that constrain in-water construction time

Figure 2



The 5DPM method illustrated in this case study can be applied as a benchmark starting before a project's implementation, and periodically throughout the project's development stages. By identifying the greatest complexity at various points in time, project managers are empowered to allocate resources to the most complex dimension at that particular time.

Resources to Help You Use Project Management Strategies for Complex Projects (R10)

- A **demonstration workshop** enables State and local transportation personnel to realize the product benefits first-hand by applying it to a real project.
- The project team receives a **summary report** after the workshop, which outlines the **action plans and execution tools** to manage project complexities.
- **Training** for agency staff in facilitating an R10 workshop, and its related training materials are available to learn the skill set to apply the product to future projects.
- The product's **guidebook and other materials** are available on the Transportation Research Board website: http://www.trb.org/Main/Blurbs/167482.aspx

To learn more, visit http://www.fhwa.dot.gov/GoSHRP2/Solutions/Renewal/R10 or contact:

- **Carlos F. Figueroa, P.E.** (FHWA Office of Innovative Program Delivery) at carlos.figueroa@dot.gov
- **Keith Platte, P.E.** (AASHTO) at kplatte@aashto.org

> We already use a lot of these strategies, but what we are learning here today is how to put them in the right order and get to them earlier. I will be able to take these materials back to my desk and use them as a resource for future projects.
>
> – Samuel Hawkes,
> RIDOT Project Planning Team

Members of the RIDOT project team discuss the I-95 Northbound Viaduct project during the R10 workshop.

The workshop program provides a collaborative environment to promote team communication and decision making. Successful workshops involve representatives from each of the project areas, such as environmental, structural, and construction engineers, to ensure the team addresses all areas of project complexity.

2 Exploring Five Methods for Managing Complexity

Once the RIDOT team identified the project complexities and developed the complexity map, it applied the **five R10 methods** to better manage the project.

Method	Examples of Team Insights
Define critical project success factors	• Minimize disruption during construction. • Secure State and Federal funding in time to advertise the project.
Assemble project team	• While the current RIDOT project team composition is adequate, additional members may be needed if a different project delivery method is selected.
Select project arrangements	• The current construction on the I-95 Southbound Viaduct project provides a good opportunity to compare project management lessons learned on this project versus the 5DPM approach on the I-95 Northbound Viaduct project. • Consider a comprehensive risk assessment and a public involvement plan before and during construction.
Prepare early cost model and finance plan	• Funding is slated for the project but this could change. The team needs to explore contingency options to avoid potential delays.
Develop project action plans	• Eight action plans were identified as a result of this process to successfully manage project complexities. Figure 3 on page 4 illustrates the process of identifying an action plan following the 5DPM approach.

3 Applying Project Execution Tools and Action Plans

Next, the RIDOT team developed action plans to manage the identified areas of complexity. They considered each of the **13 R10 project execution tools** listed below and selected (▶) 8 for specific action plans.

▶ **1.** Incentivize Critical Project Outcomes

2. Develop Dispute Resolution Plan

▶ **3.** Perform Comprehensive Risk Analysis

▶ **4.** Identify Critical Permit Issues

5. Evaluate Applications of Off-Site Fabrication

6. Determine Required Level of Involvement in ROW/Utilities

▶ **7.** Determine Work Package/Sequence

8. Design to Budget

9. Co-Locate Team

▶ **10.** Establish Flexible Design Criteria

▶ **11.** Evaluate Flexible Financing

▶ **12.** Develop Finance Expenditure Model

▶ **13.** Establish Public Involvement Plan

Figure 3 on page 4 outlines the 5DPM process for developing action plans.

Figure 3

The Development of a 5DPM Action Plan for WSDOT

Figure 3 illustrates the development of one of WSDOT's 7 action plans.

5DPM Complexity Dimension	Critical Success Factor	Selected Project Execution Tools	Action Plan
Technical	Ensure constructability	Incentivize critical project outcomes Determine work package/ sequence Establish a public involvement plan	**Review contractor's means and methods to:** • Maintain safe and consistent operations for pedestrian, bicycle, and vehicular traffic at Colman Dock • Adhere to environmental constraints, particularly the fish-spawning seasonal constraint for in-water construction • Effectively implement the General Contractor/ Construction Manager (GC/ CM) delivery method for the first time in a WSDOT project

> **"The R10 product has additional applications for other complex WSDOT projects…We've talked about these issues previously, but not with everyone together at the table. It's been very valuable. The workshop produces action plans that identify who is responsible for each deliverable."**
>
> – Mark Gaines, WSDOT

Next Steps

FHWA will provide the following support:

- Funding for assistance in developing a WSDOT standard method to determine the appropriate contracting and project delivery method
- Assistance in developing and institutionalizing a WSDOT project management policy that incorporates 5DPM

Implementation Benefits

WSDOT will continue to use R10 leading up to the construction phase, scheduled to begin in 2017. However, the project team has already benefitted from the product by:

- Conducting an in-depth self-assessment to determine opportunities to improve the complex project management maturity and capability in all phases of project development.
- Identifying potential alternative sources of project funding.
- Acknowledging the need to hire consultants who can assist them with financial planning, securing permits, and communicating public information.

SHRP2 SOLUTIONS

Implementing SHRP2

The second Strategic Highway Research Program (SHRP2) is a national partnership of the Federal Highway Administration, the American Association of State Highway and Transportation Officials, and the Transportation Research Board. Together, these partners conducted research and are deploying resulting products to help the transportation community enhance the productivity, boost the efficiency, increase the safety, and improve the reliability of the Nation's highway system.

The Washington State Department of Transportation applied *Project Management Strategies for Complex Projects (R10)* on the Seattle Multimodal Ferry Terminal at Colman Dock project as part of the SHRP2 Implementation Assistance Program.

SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD

Rhode Island Department of Transportation: Complex Bridge Replacement Case Study

An aerial image of the I-95 Northbound Viaduct Replacement site in Providence, RI.

Project Management Strategies for Complex Projects: The I-95 Northbound Viaduct Replacement Project in Providence

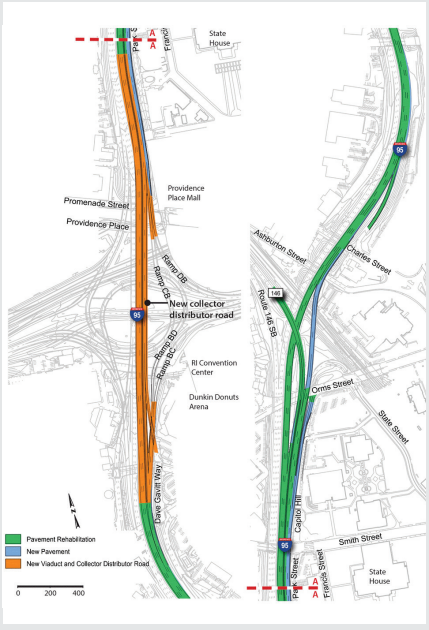
Complex highway projects face uncertain financing, right of way and technical issues, and stakeholder scrutiny, among other challenges. These issues often disrupt successful project implementation, including on-time and on-budget delivery, which may cause additional public inconvenience and dissatisfaction. Project teams that can effectively manage complex projects can minimize or avoid negative impacts.

The Rhode Island Department of Transportation (RIDOT) faces such challenges on a bridge replacement project located in downtown Providence (Figure 1 illustrates a Project Snapshot of the RIDOT I-95 Northbound Viaduct Replacement Project). RIDOT is using a product developed through the second Strategic Highway Research Program (SHRP2), called Project Management Strategies for Complex Projects, to help them deliver the project on time, within budget, and with minimal traffic disruption. The product provides a systematic and collaborative approach that goes beyond traditional project management methods, accelerates decision making, addresses complex issues, and expedites project delivery. RIDOT has already realized a number of benefits from using the product, and of most importance, the project is on track for a successful delivery.

Figure 1

Project Snapshot: RIDOT I-95 Northbound Viaduct Replacement Project

- A bridge section of Interstate 95 through downtown Providence, RI
- 1,300 feet long
- Originally built in 1964
- Current traffic volume: 180,000–190,000 vehicles per day
- Current condition is poor, requiring bi-monthly inspections to assure structural integrity
- $135M project budget
- Key project features: include new bridge structure, collector-distributor roadway, and pavement structure
- Design Bid Build delivery method
- Anticipated construction period: 2017–2021



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A key benefit of this product is that project managers can apply it to highway projects of varying sizes and types. This characteristic allows project managers to proactively and effectively identify project complexities and develop action plans to determine rational resource allocations and guide project planning and implementation. Furthermore, the 5DPM process may be repeated periodically throughout the project lifecycle to continually monitor complexity and re-allocate resources as necessary.

To learn more, visit : **www.fhwa.dot.gov/goshrp2/Solutions/Renewal/R10** or contact Carlos F. Figueroa, P.E. at **carlos.figueroa@dot.gov.**

The R10 Rhode Island Demonstration Workshop

Members of RIDOT's Northbound Viaduct Replacement project team applied Project Management Strategies for Complex Projects during a demonstration workshop. The Federal Highway Administration (FHWA) provided the workshop in order to:

- Showcase the product and provide assistance to RIDOT in applying the product's concepts and methods
- Facilitate project team communication and identify project complexities
- Identify opportunities to implement complex project management strategies in the delivery of the RIDOT highway program

The RIDOT team perceived the R10 workshop as an opportunity to learn skills that would help them plan for and address potential issues earlier in the project development process. They also wanted to compare their experience using the product on the Northbound Viaduct project with their experience applying typical management practices on the related Southbound Viaduct replacement project (under construction and scheduled for completion in 2017).

TIMELINE OF THE RIDOT WORKSHOP PROCESS

1 2 3

1 Mapping the Project's Complexity

Like most complex projects, the Northbound Viaduct Replacement project is influenced by many factors that can affect project success. Following the R10 process, the RIDOT team identified these factors within each of the **five dimensions of project management (5DPM):** cost, schedule, technical, finance, and context. Then they quantified the level of complexity for each dimension on a scale of 0 to 100, with 100 representing the greatest possible complexity and 50 representing an average level. The team plotted each dimension's relative level of complexity on a pentagon-shaped graph that provided an overall complexity area rating of 17, 057. This graph, shown in Figure 2, is a tool to visualize the 5DPM complexity as determined by the project team.

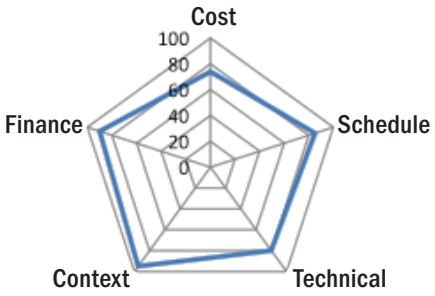
A maximum possible rating area is 24,000 (if all five dimensions are rated 100) and an average rating area is 6,000 (if all five dimensions are rated 50). The team identified the following dimensions as significantly more complex.

- **Context** (Complexity Score of 95) – Specific factors that make context the most complex project dimension include:
  - Avoiding or minimizing negative impacts to downtown Providence's economic activity during project construction
  - A required property easement with a neighboring AMTRAK facility
  - Close proximity to the Rhode Island State Capitol and visibility to politicians
  - Close proximity to residents and businesses, including several hotels that may be affected by construction noise
- **Finance** (Complexity Score of 90) – While the project has been included in the Rhode Island State budget and may receive federal aid funding, including a potential FHWA TIGER grant pending RIDOT's application and award before contract advertisement, a number of factors make finance a complex dimension:
  - State funding could change due to alternate political priorities
  - The project's estimate was recently increased to include needed preservation improvements on infrastructure connecting to the Viaduct

Figure 2

2015 Complexity Map I-95 NB Viaduct

Area = 17,057



Avg Area = 6,000; Max Area = 24,000

The 5DPM method illustrated in this case study can be applied numerous times—as a benchmark starting before a project's implementation—and periodically throughout the project's development stages. By identifying the greatest complexity at various points in time, project managers are empowered to allocate resources to the most complex project dimension at that particular time.

Resources to Help You Use Project Management Strategies for Complex Projects (R10)

- A demonstration workshop enables State and local transportation personnel to realize the product benefits first-hand by applying it to a real project.
- Workshop facilitator **training materials** educate interested agency staff and colleagues about the R10 process through a workshop or meeting environment. Through the training, staff learns the skill set to apply the product to future projects.
- The project team receives a summary report after the workshop, which outlines the **action plans and execution tools** to manage project complexities.
- The **product's guidebook and other materials** are available on the Transportation Research Board website: **http://www.trb.org/Main/Blurbs/167482.aspx**

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>
> – Samuel Hawkes,
> RIDOT Project Planning Team

Members of the RIDOT project team discuss the I-95 Northbound Viaduct project during the R10 workshop.

The workshop program provides a collaborative environment to promote team communication and decision making. Successful workshops involve representatives from each of the project areas, such as environmental, structural, and construction engineers, to ensure the team addresses all areas of project complexity.

2 Exploring Five Methods for Managing Complexity

Once the RIDOT team identified the project complexities and developed the complexity map, it applied the **five R10 methods** to better manage the project.

Method	Examples of Team Insights
Define critical project success factors	• Minimize disruption during construction. • Secure State and Federal funding in time to advertise the project.
Assemble project team	• While the current RIDOT project team composition is adequate, additional members may be needed if a different project delivery method is selected.
Select project arrangements	• The current construction on the I-95 Southbound Viaduct project provides a good opportunity to compare project management lessons learned on this project versus the 5DPM approach on the I-95 Northbound Viaduct project. • Consider a comprehensive risk assessment and a public involvement plan before and during construction.
Prepare early cost model and finance plan	• Funding is slated for the project but this could change. The team needs to explore contingency options to avoid potential delays.
Develop project action plans	• Eight action plans were identified as a result of this process to successfully manage project complexities. Figure 3 on page 4 illustrates the process of identifying an action plan following the 5DPM approach.

3 Applying Project Execution Tools and Action Plans

Next, the RIDOT team developed action plans to manage the identified areas of complexity. They considered each of the **13 R10 project execution tools** listed below and selected (▶) 8 for specific action plans.

▶ **1.** Incentivize Critical Project Outcomes

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Figure 3 on page 4 outlines the 5DPM process for developing action plans.

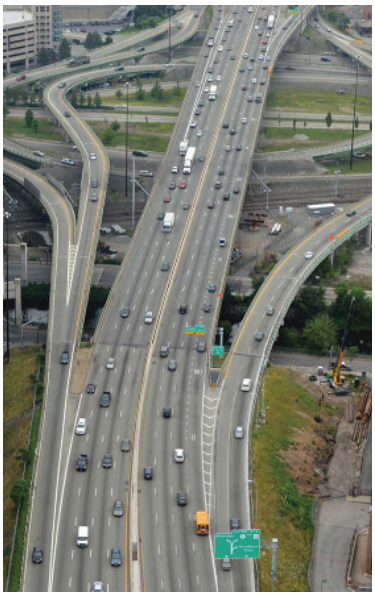
Figure 3

The Development of a 5DPM Action Plan for RIDOT

Figure 3 illustrates the development of one of RIDOT's eight action plans.

5DPM Complex Dimension	Critical Success Factor	Selected Project Execution Tools	Action Plan
Context	Minimize traffic disruption during construction	Incentivize critical project outcomes Perform comprehensive risk analysis Establish public involvement plan	Explore the use of Construction Manager/General Contractor (CM/GC) (known as Early Contractor Involvement [ECI] in Rhode Island) and/or Alternative Technical Concepts (ATC) to enhance constructability. Use ECI and ATC approaches to solicit contractor constructability input during the design phase.

> **We have a strong team that is open to new ideas. When I learned about this product as part of the (SHRP2) Implementation Assistance Program, I knew we would get a lot out of it. Plus we have an opportunity to compare our results on the Northbound project to the Southbound.**
>
> – Will Hernandez, RIDOT Managing Engineer



Next Steps

FHWA will provide the following support:

- Detailed training on the R10 execution tools
- Funding for additional RIDOT training to build capacity on managing complex projects
- Assistance in developing and institutionalizing a RIDOT project management policy that incorporates 5DPM

Implementation Benefits

RIDOT will continue to use R10 as it delivers the Northbound Providence Viaduct Replacement project. However, the project team has already benefited from the product by:

- Conducting an in-depth self-assessment to determine opportunities to improve the agency's complex project management maturity and capability in all phases of project development
- Identifying potential alternative sources of project funding
- Developing an action plan to receive contractor constructability input earlier in the design process
- Leveraging existing stakeholder relationships established during the Providence Southbound Viaduct project

SHRP2 SOLUTIONS

Implementing SHRP2

The second Strategic Highway Research Program (SHRP2) is a national partnership of the Federal Highway Administration, the American Association of State Highway and Transportation Officials, and the Transportation Research Board. Together, these partners conducted research and are deploying resulting products to help the transportation community enhance the productivity, boost the efficiency, increase the safety, and improve the reliability of the Nation's highway system.

The Rhode Island Department of Transportation applied Strategies for Managing Complex Projects on the Providence Northbound Viaduct project as part of the **SHRP2 Implementation Assistance Program.**

SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD

Wisconsin Department of Transportation: Train the Facilitator Training Case Study

The Wisconsin Department of Transportation (WisDOT) is managing a series of complex projects (left to right): the Zoo Interchange, I-94 E-W Corridor Replacement, and the Madison Beltline

Project Management Strategies for Complex Projects

The Five Dimensional Project Management Process: An Innovative Approach to Managing Complex Projects

Innovation is at the forefront as the Wisconsin Department of Transportation (WisDOT) explores a new method for managing complex projects. Moving beyond the standard, three-dimensional project management process focused on cost, schedule, and technical requirements, WisDOT is training their staff to use a **five-dimensional project management (5DPM)** approach that incorporates the dimensions of context and finance. With 5DPM, project managers become innovative problem solvers able to anticipate and prepare for challenges associated with complex transportation projects.

5DPM is the core of a product developed through the second Strategic Highway Research Program (SHRP2) called *Project Management Strategies for Complex Projects (R10).* WisDOT staff learned about 5DPM during a demonstration workshop sponsored by the Federal Highway Administration (FHWA) to assist their staff with the replacement and reconfiguration of the I-94 E-W corridor in Milwaukee. Based on this experience, WisDOT intends to integrate 5DPM into the agency's project management and delivery process. Their first step was hosting a Train the Facilitator Training to help managers understand and apply the 5DPM approach.

This case study summarizes the 5DPM concepts and strategies, and describes how WisDOT participants applied them to actual projects. The FHWA encourages transportation agencies to innovatively plan for complex projects by integrating 5DPM into their project management and delivery process. Detailed tools, presentations, and other training resources are available in the **5DPM Train the Facilitator Workbook.**

The Challenge: Managing Complex Projects Using the Three-Dimensional Project Management Process

Replacing a highway bridge that traverses prominent landmarks and neighborhoods while navigating uncertain financing. Upgrading a multimodal ferry terminal while maintaining access during construction and adhering to seasonal fish spawning windows. Complex projects like these may face indefinite financing, right of way, utility relocation and technical issues, and stakeholder scrutiny, among other challenges.

Regardless of size or type, complex projects have one thing in common: high degrees of uncertainty and unpredictability that may increase costs, add delays, and undermine public confidence. Managing complex projects using the three dimensions (cost, schedule, and technical requirements) is challenging. This approach revolves around static, sometimes stove-piped, interaction, which limits information and resources to address unexpected problems.

Complex projects require a more comprehensive approach that encourages team collaboration and communication, and adds formality to the consideration of external factors, such as the environment or public involvement, and financial issues that may impact project funding.

The SHRP2 Solution: Project Management Strategies for Complex Projects

Project Management Strategies for Complex Projects equips project managers with innovative solutions to address complex projects. It was the tenth research project in the SHRP2 Renewal Focus Area and is also known as Renewal 10 (R10). The R10 product guides project teams through 5DPM: cost, schedule, technical requirements, finance, and context, expanding on the three-dimensional process. 5DPM facilitates the integration of these factors into the overall project management process. Using R10's planning methods and execution tools, project teams 1) quantify the level of complexity in each of the five dimensions, 2) apply the planning methods to the most complex areas, and 3) develop action plans and identify execution tools to address complexities.

5DPM fosters dynamic interactions through early communication and collaboration by involving the entire project team and supporting partners from startup through construction. Building stronger partnerships sets the stage for effective project management, enabling teams to proactively identify project complexities, develop action plans to determine rational resource allocations, and guide project planning and implementation. The 5DPM process may be repeated periodically to continually manage complexity and re-allocate resources as necessary. A key benefit is that agencies can apply 5DPM to transportation projects of varying sizes and types.

The R10 WisDOT Train the Facilitator Training

During the Train the Facilitator Training, WisDOT staff applied *Project Management Strategies for Complex Projects*. FHWA hosted the Train the Facilitator Training in order to:

- Train project teams to implement the 5DPM approach on future complex projects
- Identify opportunities to incorporate 5DPM strategies into WisDOT's project management process
- Begin to establish an internal center of expertise on complex project management

The WisDOT participants learned about 5DPM strategies and how to begin integrating them into their organization. Then they applied 5DPM tools and methods to existing complex projects. Participants split up into three groups, each focused on an individual WisDOT project. One group explored the Madison Beltline project, which is outlined in the Project Snapshot. This case study uses the Madison Beltline project to explain the 5DPM exercises and their implementation benefits.

WisDOT staff attends a 1.5 day Train the Facilitator Training in Milwaukee, Wisconsin

THE WisDOT TRAIN THE FACILITATOR TRAINING TIMELINE

1 2 3

1 Mapping the Project's Complexity

Understanding the project's complexity in terms of the five dimensions lays the foundation for the 5DPM process.

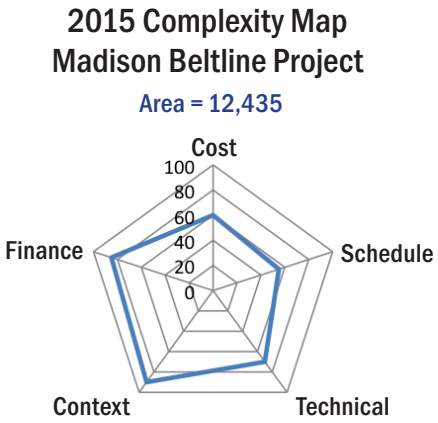
Creating a 5DPM complexity map benefits the project team in the following ways:

- Allows the project team to identify and discuss critical project issues at an earlier stage
- Highlights the complexity dimension(s) that most affect the project's success
- Facilitates process of resource allocation to address project complexities and maximize potential for project success
- Offers the ability to track project performance by dimension over time

The Madison Beltline group identified critical success factors within each of the **five dimensions of project management (5DPM):** cost, schedule, technical, finance, and context. Then they quantified the level of complexity for each dimension on a scale of 0 to 100, with 100 representing the greatest possible complexity and 50 representing an average level. The team plotted each dimension's relative level of complexity on a pentagon-shaped graph that provided an overall complexity area rating of 12,435. This graph, shown in Figure 1, is a tool to visualize the 5DPM complexity as determined by the project team. A maximum possible rating area is 24,000 (if all five dimensions are rated 100) and an average rating area is 6,000 (if all five dimensions are rated 50). The team identified the following dimensions as significantly more complex:

- **Context** (Complexity Score of 90) – Specific factors that make context the most complex dimension include:
  - The need for local acceptance, particularly from bike and transit advocates
  - Navigating environmental limitations during construction: wetlands, an arboretum, and lakes that intersect or surround the Beltline
  - The challenges of maintaining capacity while rebuilding the Beltline
- **Finance** (Complexity Score of 85) – Specific factors that make finance the second most complex dimension include:
  - The need to secure the project's placement in the State's legislature to be funded by 2022 to begin construction by 2025. If the project isn't funded in time, WisDOT would have to delay completing the project design and beginning construction on the project.

Figure 1



> "The 5DPM process has numerous benefits. The complexity map is a useful visual tool. The success factors and targeted action plans allow you to see where you need to focus. The gap analysis tool helped WisDOT understand their unique challenges."
>
> – Michael Treazise, WisDOT

Resources to Help You Train Your Staff in Project Management Strategies for Complex Projects (R10)

- **The 5DPM Train the Facilitator Workbook** is available on the GoSHRP2 Website
- The R10 product's **guidebook and other materials** are available on the Transportation Research Board website: http://www.trb.org/Main/Blurbs/167482.aspx

To learn more, visit http://www.fhwa.dot.gov/GoShrp2/Solutions/Renewal/R10 or contact:

- Carlos F. Figueroa, P.E. (FHWA Office of Innovative Program Delivery) at carlos.figueroa@dot.gov
- Keith Platte, P.E. (AASHTO) at kplatte@aashto.org

Project Snapshot: The Madison Beltline Project

- Principal artery and multilane urban freeway originally constructed in the 1950s in southwest Wisconsin in Dane County
- Up to 112,000 vehicles per day travel on the Madison Beltline
- Dane County's population is expected to add 120,000 residents between 2010 and 2040 with no capacity on the Beltline to serve this growth
- Bridges and pavement are aging and deteriorating. Ramps and shoulders do not meet current design standards.
- Key project features: replacement of existing facility, improvements to bicycle and pedestrian facilities
- Planning and Environment Linkages (PEL) and National Environmental Policy Act (NEPA) studies to be completed by 2020 before proposing recommendations to Transportation Projects Commission for funding of final design and construction
- Anticipated construction to begin by 2025

Up to 112,000 vehicles travel per day on the Madison Beltline through neighborhoods, natural areas, and business districts

2 Exploring 5DPM Planning Methods for Managing Complexity

Once the Madison Beltline group identified the project complexities and developed the complexity map, it applied the **5DPM planning methods** listed in the table below (the 5DPM planning methods are described in detail in the R10 guidebook). For the purpose of the training, the group applied the 5DPM planning methods to each of the most complex dimensions (context and finance). The group first identified the critical project success factors. In practice, this step alerts project teams to potential issues. The project team then outlined the next steps to meet the objectives of the critical project success factors.

5DPM Planning Methods	Examples of Team Insights
Define critical project success factors	• Context Dimension: Obtain bike and transit group acceptance of the preferred National Environmental Policy Act (NEPA) project alternative. • Finance Dimension: Secure the project's placement in the State's legislature budget and its enumeration in 2022 in order to begin construction in 2025.
Assemble project team	• Hire two public involvement specialists to communicate and engage with stakeholders before and during construction.
Select project arrangements	• Execute a consultant contract to hire the public involvement specialists to lead the public involvement process.
Prepare early cost model and finance plan	The team mapped the project's cash inflow and outflow and identified secured and unsecured funding sources. After the exercise, the team: • Determined that there appears to be sufficient funding for the Beltline study. The remaining funding will depend on its inclusion in the State legislature budget and if it is funded by 2022 to begin construction in 2025. If this doesn't happen, WisDOT will need to begin identifying other project funding sources or the project will be delayed until it is completely funded.
Develop project action plans	• The team developed one action plan to successfully manage project complexities within the context dimension. Figure 2 on page 4 illustrates the process of identifying an action plan following the 5DPM approach.

3 Applying 5DPM Project Execution Tools and Action Plans

The Madison Beltline group developed one action plan to manage the project complexities within the context dimension. The action plan formally establishes ideas, resources, and a schedule to address potential project speedbumps. The group considered each of the **13 R10 project execution tools** listed below and selected (▶) one tool. For an actual project, more than one would likely be used.

1. Incentivize Critical Project Outcomes
2. Develop Dispute Resolution Plan
3. Perform Comprehensive Risk Analysis
4. Identify Critical Permit Issues
5. Evaluate Applications of Off-Site Fabrication
6. Determine Required Level of Involvement in ROW/Utilities
7. Determine Work Package/Sequence
8. Design to Budget
9. Co-Locate Team
10. Establish Flexible Design Criteria
11. Evaluate Flexible Financing
12. Develop Finance Expenditure Model
13. ▶ **Establish Public Involvement Plan**

Figure 2 on page 4 outlines the 5DPM process for developing action plans.

Figure 2

The Development of a 5DPM Action Plan for WisDOT

Figure 2 illustrates the development of one WisDOT 5DPM action plan.

5DPM Complexity Dimension	Critical Success Factor	Selected 5DPM Project Execution Tools	5DPM Action Plan
Context	Obtain bike and transit group acceptance of the preferred National Environmental Policy Act (NEPA) project alternative	Tool 13: Establish public involvement plan	**Develop a public involvement plan to:** Address public concern that the project will lessen various modes of transit due to the increase of highway construction. Secure legislative support and funding to establish a new bus barn to add more metro buses to bus routes and promote various modes of transit.

> **If we do a better job defining complexity within complex projects, we can start building confidence within WisDOT and in the legislature, municipalities, and general public. 5DPM helps you document project data and funding by mapping out a well-defined process and clearly identifying next steps.** – Larry Jones, WisDOT

R10 Self-Assessment Survey

Before completing the training exercises, WisDOT participants reviewed the **R10 Self-Assessment Survey.** This tool is recommended for periodic assessment of an organization's maturity and level of formal documentation relative to the 5DPM approach. An agency rates its maturity and level of formal documentation based on 1–5 levels, with level 5 representing a strong sense of teamwork and formal documentation and level 1 representing an initial level of organizational maturity. The survey results are displayed on a color-coded map of organizational maturity that includes specifics about where opportunity for additional maturity and formality should be considered. When conducting the R10 Self-Assessment Survey, agencies should involve representatives from all areas within the organization to ensure a variety of perspectives and obtain comprehensive results.

Next Steps

WisDOT will take steps to incorporate 5DPM into its agency-wide project management process, beginning with a review of its Facilities Development Manual and Mega Project Guidelines.

Implementation Benefits

WisDOT plans to use the 5DPM process for a variety of complex projects. Agencies that adopt the 5DPM approach can benefit from:

- Identifying and anticipating potential issues early throughout the design and construction process to help project teams bolster public confidence and adhere to a proposed budget and schedule
- Acknowledging the need to establish a reliable funding stream by identifying resources earlier in the process
- Improving the project management process from startup through construction by buildling strong partnerships to promote and facilitate team collaboration and communication
- Identifying opportunities to improve the organizational project management maturity and capability in all phases of project development

Implementing SHRP2

The second Strategic Highway Research Program (SHRP2) is a national partnership of the Federal Highway Administration, the American Association of State Highway and Transportation Officials, and the Transportation Research Board. Together, these partners conducted research and are deploying resulting products to help the transportation community enhance productivity, boost efficiency, increase safety, and improve the reliability of the Nation's highway system.

The Wisconsin Department of Transportation applied *Project Management Strategies for Complex Projects (R10)* on various complex projects as part of a Train the Facilitator Training under the **SHRP2 Implementation Assistance Program.**