SHRP 2 Renewal Focus Area Overview
June 12, 2012
AASHTO Subcommittee on Design

SHRP2
STRATEGIC HIGHWAY RESEARCH PROGRAM

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

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Providing outstanding customer service for the 21st Century

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FOCUS AREAS

#1. Safety ($48m): to prevent or reduce the severity of highway crashes by understanding driving behavior.

#2. Renewal ($37.5 m): to renew aging infrastructure through rapid design and construction methods that minimize disruption and produce long-lived facilities.

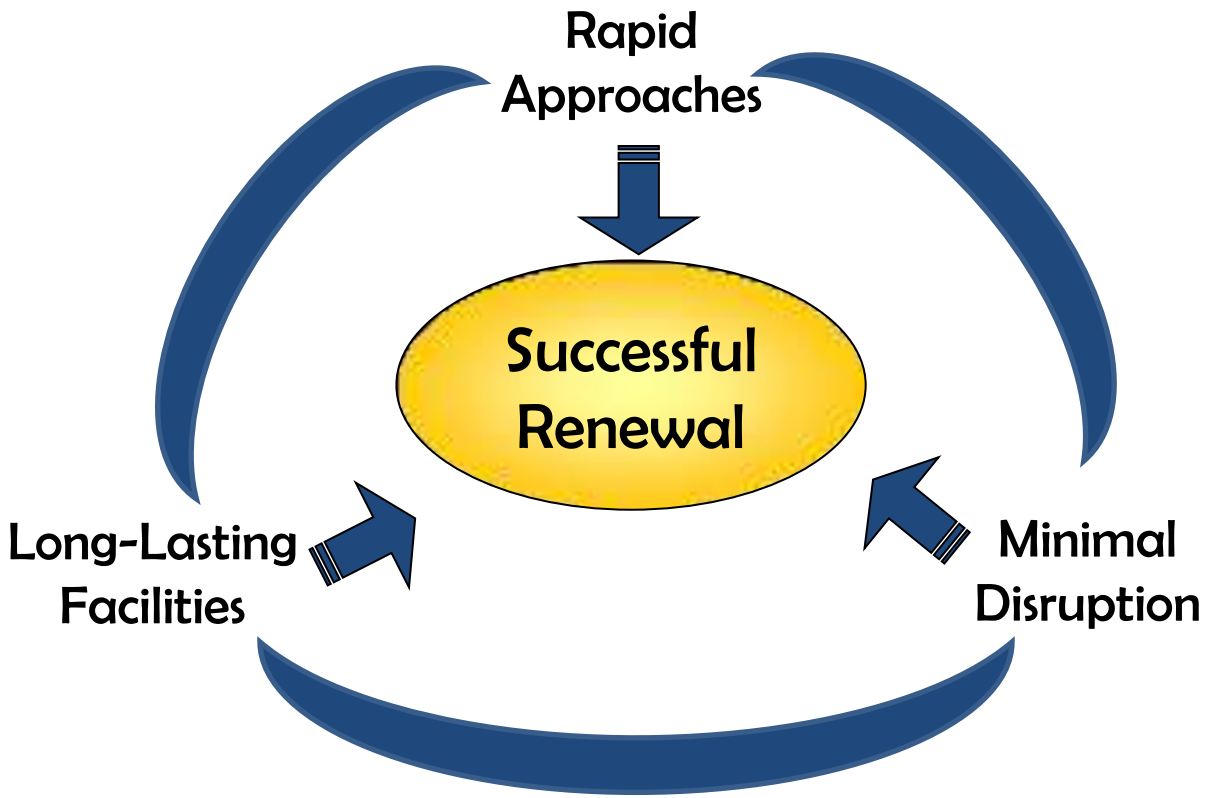
FOCUS AREAS

#3. Reliability ($20m): to provide reliable travel times by preventing and reducing the impact of non-recurring incidents.

#4. Capacity ($21m): to integrate mobility, economic, environmental, and community needs into the planning and design of new highway capacity.

SHRP 2 Renewal focus area addresses the need to develop a consistent, systematic approach to completing highway projects quickly, with minimal disruption to the community, and producing long-lasting facilities

Renewal Program - Goals



Renewal Projects by Objective

- **Rapid Approaches - 19 Projects**
  - Faster In Situ Construction (6 Projects)
  - Minimize Field Fabrication (2 Projects)
  - Perform Faster Inspection & Monitoring (8 Projects)
  - Facilitate Innovative Contracting (3 Projects)

- **Minimize Disruption - 6 Projects**
  - Interaction with Railroads (2 Projects)
  - Interaction with Utility Owners (3 Projects)
  - Plan Improvements to Mitigate Disruption (1 Product)

- **Building Facilities that Last - 5 Projects**
  - Design & Construct Low Maintenance Facilities (4 Projects)
  - Preserve Facility Life (1 Projects)

31 Research Projects - $37.5 Million

Rapid Approaches

- R01. Locating Utilities*
- R02. Geotech Solutions
- R03. Worker Fatigue
- R04. Innovative Bridge Designs
- R05. Modular Pavement
- R06. High-Speed NDT*
- R07. Performance Specs
- R09. Risk Manual
- R10. Project Management for Complex Projects

Minimize Disruption

- R11. Strategic Approaches at Corridor/Network Level
- R16. Railroad-DOT Mitigation Strategies*
- R15. Integrating Utility and Transportation Agency Priorities*

Long-Lived Facilities

- R19. Bridges for Service Life of 100 Years*
- R21. Composite Systems
- R23. Using Existing In-place Pavement & Achieving long Life
- R26. Preservation Approaches

Technology Related

Project Delivery Related

* Indicates Multiple Projects

Research Projects Completed

Rapid Approaches

- ✓R01. Locating Utilities
- ✓R02. Geotech Solutions
- ✓R05. Modular Pavement
- ✓R06. High-Speed NDT
- ✓R06-A. NDT for Bridge Decks
- ✓R06-B. Evaluation of Hand Held Spectroscopy Devices
- ✓R06-C. NDT to Measure New HMA Layer Uniformity

Rapid Approaches

- ✓R06-D. NDT to Identify Delamenations between HMA Layers
- ✓R06-E. Real-Time PCC pavement Smoothness During Construction
- ✓R09. Risk Manual

Minimize Disruption

- ✓R16. Railroad-DOT Mitigation Strategies
- ✓R15. Integrating Utility and Transportation Agency Priorities*
- ✓R15B. Utility DOT Conflict Mitigation

Long-Lived Facilities

- ✓R21. Composite Systems
- ✓R23. Using Existing In-place Pavement & Achieving long Life
- ✓R26. Preservation Approaches

Technology Related

Project Delivery Related

UTILITIES

These products advance the practice of identifying underground utilities and support coordination among transportation agencies and utility companies.

- ❑ **R01. ENCOURAGING INNOVATION IN LOCATING AND CHARACTERIZING UNDERGROUND UTILITIES**
- ❑ **R01-A. TECHNOLOGIES TO SUPPORT STORAGE, RETRIEVAL, AND UTILIZATION OF 3-D UTILITY LOCATION DATA**
- ❑ **R01-B. MULTI-SENSOR PLATFORMS FOR LOCATING UNDERGROUND UTILITIES**
- ❑ **R01-C. INNOVATION IN LOCATION OF DEEP UTILITIES**
- ❑ **R15-B. IDENTIFICATION OF UTILITY CONFLICTS AND SOLUTIONS**

Highway Renewal Project

Phase	Utility Data/Coordination Needs	SHRP 2 Tools
Preliminary Design	Existing Records (QLD)	R01-A
Preliminary Design	Above-Ground Survey Data (QLC)	R01-A
Preliminary Design	Coordination with Utilities	R01-A, R15-B
Detailed Design	Geophysical Data (QLB)	R01-A,B,C
Detailed Design	Exposure (test holes, vacuum evacuation) (QLA)	R01-A
Detailed Design	Additional Coordination with Utilities	R15-B
Construction	Confirm/Revise Location	R01-A,B,C
Construction	Additional Coordination with Utilities	R15-B

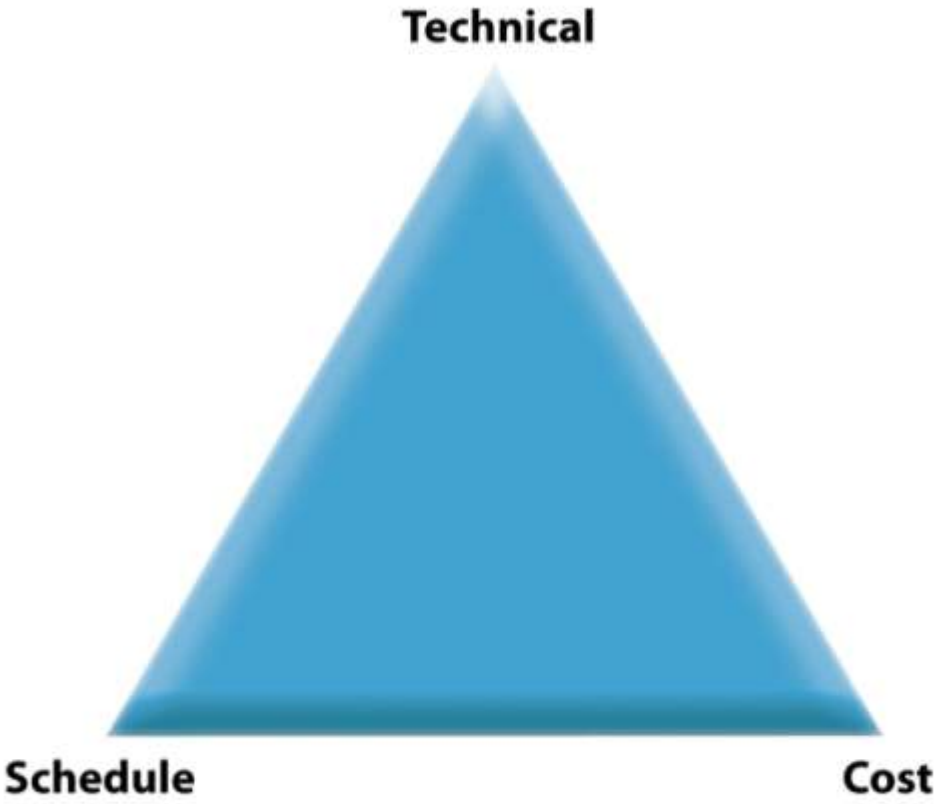
R01-A: 3-D Utility Data Storage, Retrieval, Utilization
R01-B: Multi-Sensor Platforms
R01-C: Expanding the Locatable Zone
R15-B: Utility Conflicts & Solutions

QLA = Data Quality Level A, etc.

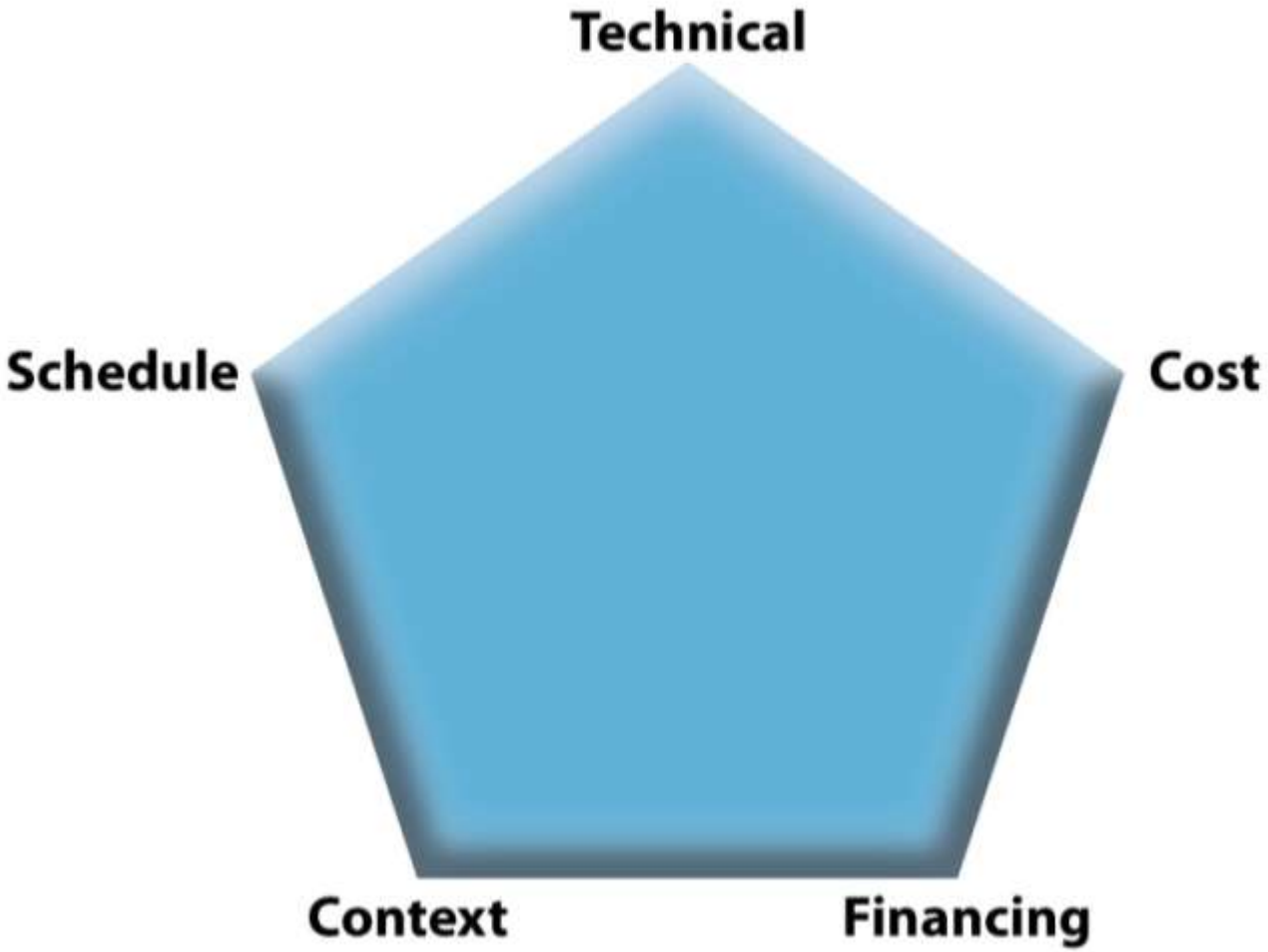
SHRP 2 R10 Objectives

- Develop tools that help DOTs get in, get out, and stay out
- Project management practices to deliver complex projects using innovative strategies
- Development and deployment of tools
- Facilitate fundamental change in rehabilitating the transportation infrastructure

Three-Dimensional Project Management



Five-Dimensional Project Management



Definition

Traditional

- Standard practices can be used
  - Design
  - Funding
  - Contracting
- Static interactions
- High level of similarity to prior projects creates certainty

Complex

- Standard practices cannot be used
  - Design
  - Funding
  - Contracting
- Dynamic interactions
- High level of uncertainty regarding objectives and/or implementation

Cost ≠ Financing

Cost (Estimates, Cash Flow)

- Project estimates
- Uncertainty
- Contingency
- Project costs—i.e., road user costs, ROW
- Design to a budget

Financing (Funding)

- Sources of funding
  - Federal vs. state vs. other
  - Bond-funding
  - Revenue generation/sharing
  - International funding
- Public Private Partnerships
- Variations in material inflation rates

Schedule Dimension Factors

- Time
- Schedule risk
- Prescribed milestones
- Availability of resources

Technical Dimension Factors

- Design
- Scope of work
- Quality
- Need for integrated delivery

Context Dimension Factors

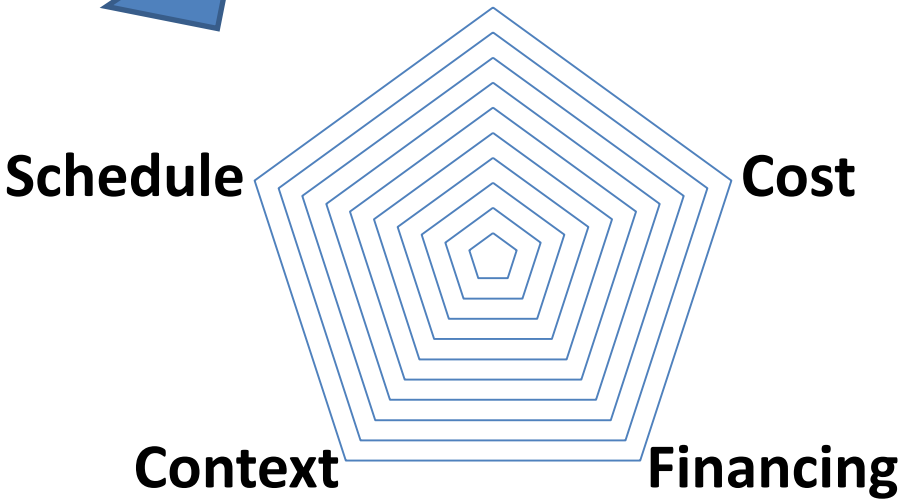
- Political/procurement constraints
- Environmental issues
- Public perceptions
- Right-of-way acquisition
- Sustainability requirements
- Owner preferences/biases
- Utilities

Complexity Mapping

Project:

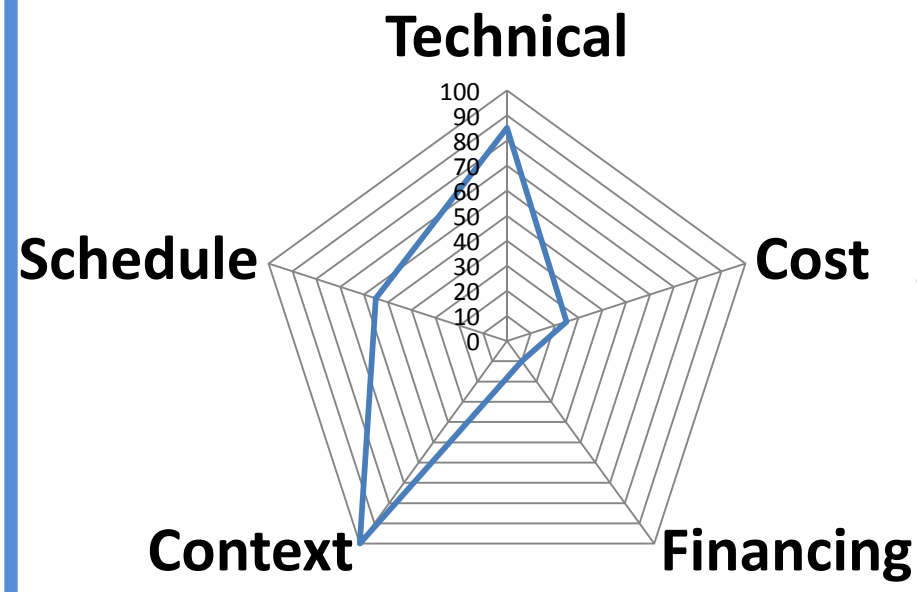
Please circle the top 3 in each dimension		Within each dimension, how is this project different (more complex) than the "traditional" project?
Cost Factors		
Contingency usage		
Risk analysis		
Estimate formation		
Owner resource cost allocation		
Cost control		
Optimization's impact on project cost		
Incentive usage		
Material cost issues		
User costs/benefits		
Payment restrictions		
Schedule Factors		
Timeline requirements		
Risk analysis		
Milestones		
Schedule control		
Optimization's impact on project schedule		
Resource availability		
Scheduling System/Software		
Work Breakdown Structure		
Earned Value Analysis		

	Scale			
	Minimal		Average	High
Cost Dimension Complexity	0	25	50	75	100
Schedule Dimension Complexity	0	25	50	75	100
Technical Dimension Complexity	0	25	50	75	100
Context Dimension Complexity	0	25	50	75	100
Financing Dimension Complexity	0	25	50	75	100

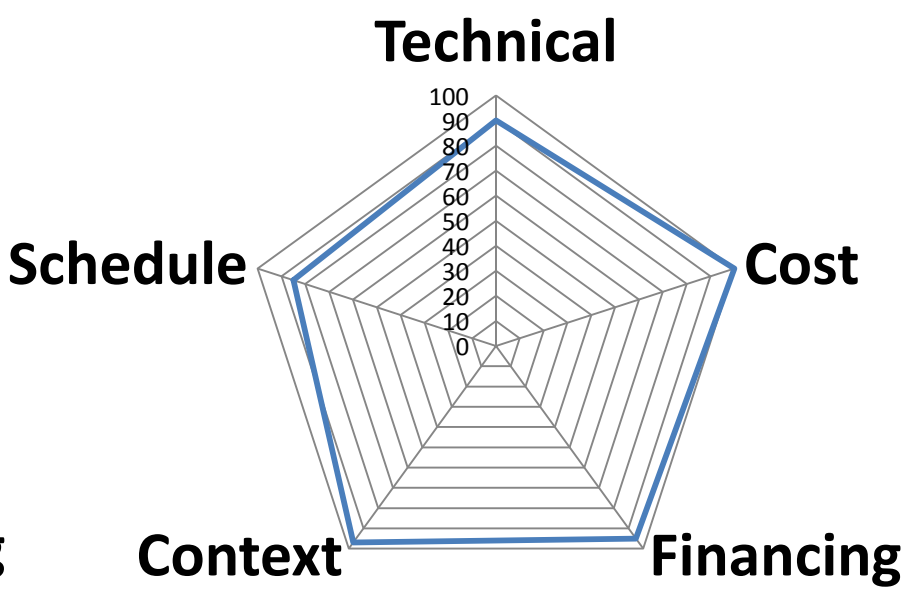


Project Complexity

Lewis and Clark Bridge



T-REX



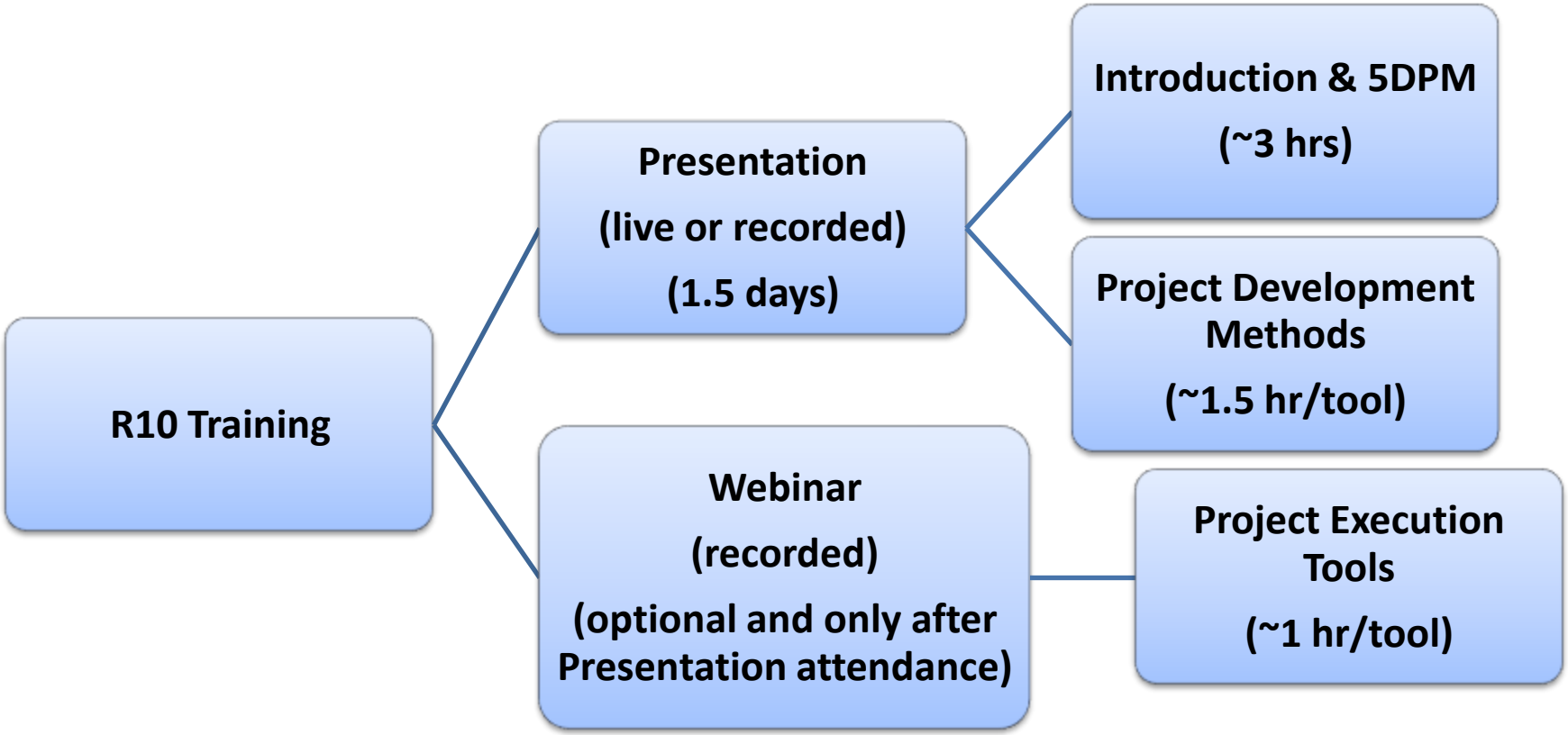
Uses of Complexity Mapping

- Discussing critical project issues at early stage of project planning and project definition
- Shared understanding of complexity dimension that is driving the project
- Rational resource allocation to maximize potential for project success
- Tracking project performance over time

Possible Complexity Mitigation Strategies

- Incentivize Critical Project Outcomes
- Develop Dispute Resolution Plan
- Perform Comprehensive Risk Analysis
- Identify Critical Permit Issues
- Evaluate Applications of Off-Site Fabrication
- Determine Required Level of Involvement in ROW/Utilities
- Determine Work Package/Sequence
- Design to Budget
- Co-Locate Team
- Establish Flexible Design Criteria
- Evaluate Flexible Financing
- Develop Finance Expenditure Model
- Establish Public Involvement Plan

Research Project Product-Training



Next Steps

- Training (only 1 left)
  - St. Paul, MN
    - October11-12, 2012
    - Please register at http://www.intrans.iastate.edu/events/shrp2complexprojects/
- Implementation (Pilots)
  - Two Projects
  - Early in project development
  - Work with for 1 year (starting summer/fall 2012)

Thanks

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