

Colorado Risk-Based Cost Estimation Peer Exchange

May 10-11, 2016

DoubleTree Denver-Aurora, 13696 East Iliff Place, Aurora, CO 80014

Meeting Summary

Workshop Purpose and Agenda

CDOT's goal is to improve its risk-based cost estimation (RBCE) methodology in order to optimize program delivery.

The purpose was to inform CDOT on best practices and lessons learned so that staff can customize a vision and recommended approach afterwards.

Agenda topics included the following:

- Presentations and Q/A on state DOT programs - CO, FL, GA, MN, NV, OR, and WA.
- Identification of questions for further discussion
- Panel and full group discussion of detailed questions
- Discuss CDOT next steps

Participants are listed at the end of this document. Peer Exchange resources, including presentations, are available at <https://www.codot.gov/business/eema/risk-based-cost-estimation-rbce-information>.

Overview of State Dept. of Transportation Programs

Brief information on state programs is provided below. More detail is provided in the presentations and in the best practices and considerations section below.

Colorado – Currently using point estimates vs. probabilistic estimates. Estimates are based mainly on production based spreadsheets, market information, and historical bid prices. A 30% contingency is standard. Some tools are available, such as a Cost Planner that provides historical data in a statistical format and a risk assessment worksheet. These tools are not yet used consistently across CDOT. A project management training program is under development.

Florida – Statewide and Regional Risk Team approach to identify and support projects from a centralized office. There was no formal mandate. Instead, buy-in was developed by demonstrating success on example projects. Most projects are more complex than the ones CDOT works on (i.e., more than \$100M).

Georgia – Tool for incorporating typical risks in planning estimates, which considers a 3-year rolling average for cost data. The tool has been utilized by some MPOs.

Minnesota – Initiated to improve transparency with the public. It was first used on the Corridors of Commerce effort, which was primarily an outsourced risk-modelling effort. Staff are in the midst of 1) figuring out appropriate process for less complex projects, 2) building buy-in across the DOT and 3) building internal expertise.

Nevada – Centralized approach used on high-risk projects. It was initiated four years ago due to legislative requirements and political dynamics.

Oregon – Used a SHRP2 effort on three pilot sites and is in the midst of building upon this effort to implement a tiered approach.

Washington – Sophisticated approach with a core team of internal experts. It was mandated from Washington legislature 13 years ago due to significant public credibility challenges as a result of the breakdown of the Seattle tunnel.

Key Topics of Discussion

The group discussion is organized according to subtopics below.

RBCE as Part of Broader Risk Management Approach

- RCBE is just the beginning of a broader risk management approach that involves identifying risks, transferring, mitigating or accepting, and monitoring them. It provides data for optimizing project objectives. The process is pointless if you identify risks and then don't do anything about those risks. It must be incorporated into broader Project Management efforts.
- People will not stop padding estimates unless you need to have tools in place to support them if the costs go up.
- It's important to have program awareness when it comes to figuring out how to deal with risks by looking at how projects function together.

Making the Case to Executive Mgmt. for a RBCE Approach

Status of CDOT Executive Management Engagement: Scott McDaniel and Josh Laipply supported exploring RBCE opportunities through this event. Specifically, they encouraged exploration through a Quality Improvement Council (QIC) Joint Process Review, which involves reviewing risks to the Federal Aid Highway Program and making recommendations on how to mitigate them. Findings from this Peer Exchange will be shared with the full Executive Management Team.

Key Messages/ Approaches for Making a Compelling Case:

- Describe other DOTs and other industry's success. Some potential resources for compelling information include: ASHTO Technical Committee which covers fundamentals, Project Management Institute, aacei.org, Bent Flyvbjerg's research on mega projects and risks, and the WSDOT's Gray Notebook. It's important to keep descriptions or rationale and pros/cons simple.
- Describe a compelling problem that needs to be solved or an opportunity. This may be involve spending some time gathering information on what Executive Management is particularly worried about.

Potential messages:

- Build credibility with the Transportation Commission.
- RBCE allows for real-time decisions. It is a tool to manage cost and schedules and it helps to build a risk reserve. Running risk models helps staff figure out how to make decisions on delivery. It is easier to respond to uncontrollable risks such as inflation when using ranges instead of point estimates.
- There may be opportunities to manage risks at a programmatic level instead of a project-by-project level.
- Need to increase the number of bidders by having more realistic scopes of work and budgets.

States' triggers and/or messages:

- WSDOT's change to a RBCE approach was mandated from the Washington legislature due to significant public credibility challenges as a result of the breakdown of the Seattle tunnel.

- During the economic downturn, FDOT was having major impacts on costs due to market conditions and RBCE was recommended in order to manage contingences and deliver more projects. Similarly, MnDOT uses RBCE to make their program more stable by understanding and or eliminating contingencies and GDOT management wanted contingencies down to 5-10%.
- NDOT made the case based on improving the ranges to determine project affordability.
- Demonstrate via pilot projects.
 - Be strategic in choosing pilot projects (e.g., find ways to make it competition across regions). It's critical to recognize and appreciate teams that take the lead.
 - WSDOT's first big project was the Alaska viaduct, which was \$750+ and involved significant consultant support. They did a few other big projects to practice and refine the approach before using it more broadly.
 - GDOT had consultants do 500 projects to test it.
 - MN used it for a few Major Projects.
 - FDOT started with a few projects; it was not a fast implementation. It would have been helpful to have a pilot in each District.

How to Demonstrate Effectiveness of RBCE Approaches:

The panel described tracking as a challenge. You can't just do a before and after comparison because projects change. Some approaches include:

- WSDOT was able to demonstrate improved transparency and credibility since the Gas Tax was approved.
- WSDOT tracks change orders (see presentation).
- WSDOT tracks how the risk profile is changing to demonstrate that risks are being mitigated.
- FDOT uses a range of performances to demonstrate efficacy such as adopted vs. low bid and official estimate vs. low bid (see presentation).
- Compare outcomes of projects with risk assessments and those without.

Implementation

Champions and Implementation Roll Out:

- It's helpful to have a cross-section of people from various departments to champion the use of RCBE, and to keep the group small. CDOT needs champions from all regions. It may be helpful to focus on younger engineers who may be more open to new, innovative approaches.
- Identify people who are innovators, who would be interested in working with RBCE and then you can have in-house trained staff to develop practices and train other staff.
- WSDOT recommends developing a program while developing a risk awareness culture. It is best if there is a champion at the Assistant Secretary or Director level to set the vision/ mandate.
- For NDOT, the Deputy Director championed it, though project managers took the lead in developing the program, and staff got onboard quickly. It was not a hard sell.
- FDOT began by forming a diverse Statewide Risk Management Team to deal with risks (see presentation for specifics) who sold the idea to leadership. They sold the approach more broadly by demonstrating success with pilot projects. FDOT's advice was not to go too fast.

Building a Culture that Considers Risk

- Spend a few minutes discussing risk at all regular meetings. What are you worried about and how can I help with these risks? For project update meetings have a short update and then focus on problems and recommended solutions.

- You can't change culture without changing behavior. Everyone has to be doing little things, like discussing risk for a few minutes in each conversation.

Training

- FDOT initially provided quarterly training to Directors, design engineers and project managers. Now it has a training expo on the entire risk management process once a year, training on its modelling tool 4x a year, a recorded webinar, and staff taps into other trainings when possible.
- WSDOT had a probability and risk assessment design "academy" five years ago and a cost estimation class was offered at least 20 times over the course of 3 years. Training has decreased in recent years due to funding resources, despite its importance.
- GDOT does training every two years. David's goal is to have two subject matter experts in the office to provide support.
- MnDOT did PMI training, but believes some courses aren't very useful. Staff are in the midst of refining their training approach. They are currently obtaining information on what staff are looking for and trying to provide shorter, tailored brownbags and webinars, as opposed to a general overview.
- ODOT developed a statewide PMI-based Project Management training program for fundamentals. They are going to have training on SHRP2 tool.
- FHWA/ NHI is developing a RBCE training which should be available in two years. It may be web-based.
- It's a challenge to use these kinds of tools if you're not using them regularly. It's important to get staff in the habit of using simple techniques routinely in order to reinforcing training.

RBCE Approach

Impact on Setting Budgets and Schedules:

- Make sure your base cost/base estimates are solid before risks are incorporated. A probabilistic, risk-based cost estimate doesn't improve a poor initial estimate.
- Most states use RBCE before obtaining approval for a budget. Their budgets are set after scoping instead of after planning estimates (e.g., MnDOT, NDOT, and WSDOT). Waiting to add projects to the STIP until after scoping helps build credibility with the public because budgets are less likely to change significantly since scoping considers environmental process, etc. MnDOT scopes 5 years out and design can be a year or two years after scoping.
- At CDOT, the Transportation Commission sets project budgets based on planning estimates and they are STIP'd at that time. Asset Management identifies large capital improvement projects for 4-5 years and regions identify projects. If projects go 15% over the planning budget, PM's have to request additional funding from the Transportation Commission. CDOT is beginning to go back to a pool process in which Regions can better manage costs among a pool of projects.
- Schedules are incorporated into RBCE approaches. The schedule influences costs. They have to be considered together because as a schedule is pushed out, costs go up.
- WSDOT's cost estimating group only advises and never takes over the estimate, which is very different from CDOT's process in which there is a handoff to the PS&E group at 90% to refine the final budget for ad. MnDOT's cost estimating group takes the budget at 90-95%.
- Incorporating inflation: Some states include expected inflation in their estimating tools (e.g., GDOT, FDOT) and others are considering doing this (e.g., MnDOT). WSDOT took inflation out of the stakeholder workshops because it was causing unnecessary challenges. Also, legislature obtained amnesty for their projects. In general, do the best estimation you can, but review again when it's only a year until the project.

Scalability:

- RBCE may not be necessary for simple jobs; whether or not there are concerns about a project is more important than the project size. Ensure you are thoughtful about how it will work based on the scale of the project.
- CADOT has a resource called “A Scalable Project” that may be a helpful.
- WSDOT had adjusted its tool to work for any project size with detail ranging based on project complexity. Staff decide if/how to use it on a project-by-project basis. In general, they always use RBCE on projects greater than \$10M, make a project-by-project decision on projects from \$3-10M based on complexity, and do an informal process for projects under \$3M (e.g., talk about it and run an Excel analysis that focuses only on significant risks). Projects with more than a 15% contingency must go through a RBCE process. All projects are required to have a risk management plan and it’s up to each Program Manager to decide how to ensure risks are being eliminated or mitigated. David requires that all of his projects complete risk registers.
- MnDOT is interested in using RCBE program-wide, but wants to make sure scalability ensure the process still works. Currently high risk projects above \$10M require a Monte Carlo assessment and projects above \$25M require a formal risk workshop.
- NDOT only uses RCBE on difficult projects.
- ODOT has a tiered system which categorizes projects and determines what level of detail is appropriate.
- FDOT does not do a risk assessment unless there is at least a 15% contingency.

Specific Tools:

- Risk register templates are available on the WSDOT website. It’s important to have a unified risk register, and it shouldn’t have too much information.

Consultants and Internal Expertise:

- It’s important to avoid only hiring outside help. It’s much better to have internal staff to develop policy, create trainings and serve as an ongoing resource.
- WSDOT management decided that they couldn’t afford consultants for small projects and provided resources for Ovidiu’s team. There are now 3-5 people working on RBCE. Consultants are still used on some big projects, mostly for independent review.
- WSDOT and MnDOT do design and risk assessment internally and don’t utilize consultants until after scoping.
- NDOT does both internally and with consultants.
- GDOT is primarily done internally.

Approaches for Sharing Project Risks:

- WSDOT publishes all risk workshop reports, a list of potential risks has been codified, and there is a quarterly report with summary risk information included (does not include information for individual projects). They’ve considered developing a database, but have been unable to proceed due to limited resources.
- It’s critical to document discussions throughout the project.

Stakeholder Workshops

- The purpose of workshops is to identify problems in estimation, and to identify and quantify risks.
- Stakeholder workshops will change depending on the complexity of the project - you may only need 1-3 people in a workshop for a small project, whereas for a big project you might have 20. FDOT generally has more participants at workshops than WSDOT.
- It’s important to talk to technical groups well in advance of workshop in order to make the workshop more efficient.
- Begin the workshop with a brief training on the RBCE process and roles.

- Spend time explaining the base cost. The budget should already be set by an estimator before the workshop.
- Having a facilitator is important and it should not be the Project Manager since they have so much technical expertise to share. At FDOT, there are some people in the Districts who can lead workshops but they often hire outside help to do the facilitations. Anyone who has a stake in the project comes to the workshop or at least the part of the discussion that relates to them. WSDOT generally uses an in-house team though it needs to be different than the person who did the initial estimation (e.g., HQ staff travel for workshops). It hires consultants for higher profile projects.

Panel Advice

- Clarify the problem you are trying to solve and adapt your tools to match your specific problems. Don't do it because it's the new thing. Ensure it is being used to address specific reasons and problems.
- Ensure you are looking at holistically as an overall risk management approach – RBCE does not work unless it's part of a broader approach. If you identify risks and don't mitigate them you are worse off.
- Focus on culture change. It takes a long time – keep pushing it.
- Identify champions at all levels. It's important to have a high-level champion and also advocates in the places where people are actually doing the work.
- KISS – Keep it Short and Simple.

CDOT Potential Next Steps

A core group comprised of John Eddy, Ben Acimovic, Ryan Sorensen, David Kosmiski and Shaun Yu (and ideally a PMO representative) will digest information from this peer exchange and develop a road map for next steps. The group discussed the importance of not trying to change too much too fast, and taking small steps immediately (i.e., not waiting to roll out a suite of tools in 2 years).

All participants were encouraged to help build a risk identification and mitigation culture by beginning to talk about risks. Updates will be shared with the group, and in the meantime they are encouraged to send any additional feedback to John Eddy.

Some potential next steps include:

- Clarify vision for risk management overall.
- Develop/ clarify messaging in writing so there is common language. Develop a purpose and need statement that defines the challenges and problems that CDOT is looking to mitigate and summarize why RBCE will help in a concise and compelling way that includes measurable outcomes. There needs to be a compelling reason for leadership to want to implement these practices. One way to think about it is – what are particularly dangerous risks out there and how can we use these techniques to manage them?
- Ensure base estimating process is solid and clarify if it should include identifying risks.
- Evaluate current efforts and tools via small group input meetings that focus on what is working well, what are areas for improvement and what are the big issues that are causing people problems.
- Provide training through a project-specific approach so people can integrate skills on a real project right away. In some current training everything works perfectly at the workshop, which is not realistic in the field.
- Implement an ADKAR based change management plan for how to move forward that includes consistent and clear communication and identifying champions willing to undertake the process with clear reinforcement and rewards for their efforts.

Participants

CDOT HQ

- Ken Auge
- George Demos
- Roselle Drahushak-Crow
- John Eddy
- Greg Jones
- Sina Khavary
- Frank Kinder
- Neil Lacey
- Roxane Olvera
- Roy Pallman
- Bill Schiebel
- Ryan Sorensen
- Mark Straub
- Shawn Yu

CDOT Region 1

- Ben Acimovic
- Dave Kosmiski

CDOT Region 2

- Mark Andrew
- Brian Barrerea
- Dan Dahlke
- John Hall
- Andy Stecklein

CDOT Region 3

- Clint Moyer
- Jason Smith

CDOT Region 4

- Lauren Boyle
- Richard Christy
- Steven Heimmer
- Ben Raitano
- Bryan Schafer
- Craig Schumacher
- Nathan Silberhorn

CDOT Region 5

- Lorna Alexander
- Brian Campbell
- David Valentinelli

FHWA

- Leslie Lahndt
- Michael Smith
- Randy Jensen

Presenters

- Greg Davis, FDOT
- David Cox, GDOT
- Jane Butzer, MnDOT
- Jennifer Read, MnDOT
- Cole Mortensen, NDOT
- Lee Ann Hart Chambers, ODOT
- Ovidiu Cretu, WSDOT
- David Smelser, WSDOT

Others

- Keith Molenaar, University of Colorado
- David Rader, Ada County, ID

Facilitation Team

- Gian Lagana, CDR Associates
- Laura Sneeringer, CDR Associates