



RESEARCH SERVICES & LIBRARY

OFFICE OF TRANSPORTATION SYSTEM MANAGEMENT

TECHNICAL SUMMARY

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PROJECT COST:

\$147,797



Risk-based cost estimates can help minimize construction delays by anticipating problems before they occur.

More Consistent Risk-Based Cost Estimates Lead to Lower Overall Project Costs

What Was the Need?

For state transportation agencies to manage and deliver projects promptly and cost-effectively, they must be able to realistically estimate project costs early in the concept development stage, before final engineering is completed. Accurate estimates help agencies set funding expectations, prioritize projects, set a baseline for project control and formalize a basis for cash flow requirements over the project's life cycle.

Accurate estimates allow for risk and uncertainty, including the many factors that can lead to increases in project costs, such as unplanned necessities related to utility relocation, environmental mitigation, traffic control, and external financial and economic circumstances. Accounting for these risks requires translating them into costs and then calculating the likelihood of their occurrence so planners can provide a cost range that includes an estimated probability for each risk within the range.

While MnDOT considers risk when estimating costs, it currently does not do so consistently across the agency. Research was needed to investigate the state of the practice for risk-based cost estimating within MnDOT as well as at other transportation agencies and construction organizations, and to provide MnDOT with draft guidance on the use of the identified methods.

What Was Our Goal?

The purpose of this project was to develop guidance for risk-based cost estimating methods that can be used consistently across MnDOT districts.

What Did We Do?

Researchers began to explore how risk-based estimating is implemented in various MnDOT districts by interviewing MnDOT employees. Then they conducted a state-of-the-practice review of risk-based cost estimating methods used by other state departments of transportation and construction organizations. Researchers presented these results to statewide MnDOT personnel during a workshop to get feedback about proposed methods, make sure they aligned with MnDOT goals, and select methods for further investigation. Researchers then developed draft guidance for using the selected methods within MnDOT.

What Did We Learn?

Researchers found that while there are some MnDOT personnel using risk-based cost estimating techniques, knowledge of these techniques is not widespread, and practices vary greatly between districts. They concluded that there were three areas of guidance relevant to risk-based estimates for MnDOT: the use of risk registers, the use of Monte Carlo simulations and communication.

Risk-based cost estimating will help MnDOT evaluate a range of possible risks early in the project planning process. This will lead to more accurate bids and fewer changes later in the project, ultimately reducing project delays and making the most efficient use of agency funds.

“This project helped us get a sense of the differences in risk-based cost estimating between MnDOT divisions—an important first step in developing a more consistent approach.”

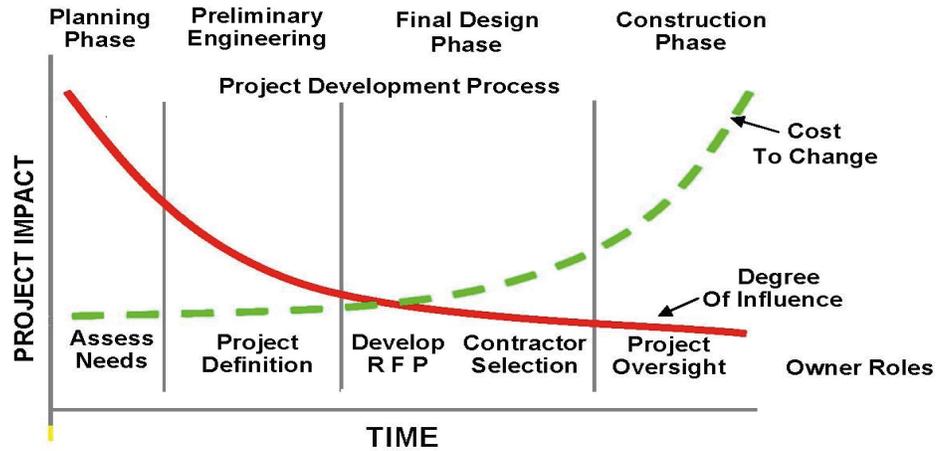
—Mary Lacho,
MnDOT State Estimates
Engineer

“It often costs more to take care of project issues if they are unplanned, so better accounting for possible risks can save on overall project costs.”

—Jennifer Shane,
Associate Professor,
Iowa State University
Department of Civil,
Construction and
Environmental
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Making changes to a project once construction has begun can be much more costly than during the planning and design phases.

Risk Registers. A risk register is a listing of the identified risks for a specific project along with other information about the risks, such as cost, schedule impacts and likelihood of occurrence. MnDOT has a standard risk register form as well as a checklist for developing this register at the Office of Project Management. Other offices also have their own versions of the risk checklist. Researchers recommend that MnDOT regularly review various checklists and update the checklist available through the Office of Project Management to reflect practices across the state. Other recommendations include reviewing risk registers regularly to identify the most prevalent risks; brainstorming risks not identified in risk registers; and considering risks beyond cost, schedule and scope, such as financial risks outside of MnDOT.

Monte Carlo Simulation. Researchers recommend that MnDOT train its personnel to use Monte Carlo simulation, a software tool that estimates the relative likelihood of a large number of possible project outcomes along with associated costs. Monte Carlo simulations should be run multiple times during various stages of the project development process. MnDOT currently has a project manager in its Metro office who employs Monte Carlo simulations on some projects. However, this resource is generally underutilized.

Communication. Researchers recommend more consistent communication within MnDOT about using risk-based cost estimating. This could include an annual meeting for estimators, project managers and others involved in the cost estimating process. At this meeting, participants from across the state could present to the group as a whole and interact individually to exchange ideas and experiences related to estimating. This meeting could also include training and workshops about using Monte Carlo simulations. Between annual meetings, researchers recommend developing a forum to exchange ideas such as a blog, Web-based forum or internal social media application.

What’s Next?

MnDOT will review the draft guidance in this project as it continues to develop a methodology for cost estimation that can be used consistently across the organization. Ultimately, incorporating risk more accurately into its cost estimates will help MnDOT optimize budgeting and deliver projects more cost-effectively.