Enterprise Risk Management at UDOT

How UDOT Is Incorporating Enterprise Risk Management Into It’s Project Delivery Process

By Fred Doehring and Kristina Narvaez
Overview of Enterprise Risk Management

- **ERM** improves an organization’s strategic decision making by addressing threats and opportunities in a way that integrates risk management with the strategic planning process.

- **ERM** is a systematic approach to managing all of an organization’s uncertainty in order to maximize shareholder value by optimizing risk taking.
Integrating ERM and Strategic Planning

- Develop ERM goals (SWOT Analysis)
- Identify risk (Risk assessment)
- Analyze, evaluate, and prioritize critical risks
- Treat critical risks, considering priority (risk treatment)
- Monitor critical risks (monitor and review)
ERM Looks at All Types of Risks

- Hazard
- Operational
- Financial
- Strategic
- Human Capital
- Legal
- Environmental
- Reputation
- Technology
Benefits of Using ERM

- Enhance decision making
- Increase profitability
- Reduce volatility
- Improve ability to meet strategic goals
- Increase management accountability
- Breaking silos—seeing risk from holistic approach
- Develop business continuity
What is UDOT?

- Utah Department of Transportation
  - NOT UTA!
- Responsible for all State and Federal Highways
- Average annual budget of about $500 M
- This summer we have $3.25 B active
- Approx. 1600 employees
- 4 Regions plus Headquarters
What is UDOT?

- UDOT’s Final Four
  - Take care of what we have
  - Make it work better
  - Increase safety
  - Increase capacity
What is UDOT?

- How do we accomplish our goals?
- Four functional areas
  - Administration
  - Maintenance
  - Operations
  - Project Delivery

- Usually 150 to 200 projects in Environmental and Design at any time
ERM in Project Management at UDOT

- We use a “Strong” PM organization
  - PM’s are dedicated full time to Project Management
  - Functional Managers
  - Use lots of Consultants.

- PM and Design are de-centralized
  - Each Region has PM and Design staff
  - Some functions are Centralized

- PM’s are responsible to assemble a Project Team
Incorporating Enterprise Risk Management

- Recent initiative to formally address risk on a project level basis.
- Past efforts have been ad-hoc
  - Proved the value of risk management
- Eating the Risk Elephant
Flavors of Risk

- Traditional Risk
  - OSHA
  - Work place safety
  - Claims
  - Etc.
Flavors of Risk

- Programmatic Risks
  - Funding Levels
  - Legislative actions
  - Reputation

- Linda Toy–Hull
- Nile Easton
Flavors of Risk

- Project Level Risks
  - Scope
  - Schedule
  - Budget
  - Quality
Currently using tools developed in Washington State

- **CEVP® (Cost Estimate Validation Process)**
  - Scalable look at project risk from a cost and schedule perspective
- **CRAVE (Cost Risk Analysis with Value Engineering)**
  - Combines CEVP® with Value Engineering
Both tools require a baseline estimate and schedule
Both tools require the development of a Risk Registry
Both tools use Monte Carlo type calculations to produce output
ERM Workshop

- Risks are identified by a multi-disciplinary team during a (usually) multi-day workshop
  - Project team members
  - Outside Subject Matter Experts
  - Delphi Method
- Each Risk is assigned a probability of occurring and cost and schedule impacts
- Risks can be Negative (Threats) or Positive (Opportunities)
BUSINESS IMPACTS
NO LEETS
GAS STATION
POLICE STA
FIRE STA
CATHOLIC CHURCH
LDS CHURCH
METHODIST CHURCH
34-37 HOMES, FULL MAT
COMMUNITY HOUSE - 3
SCHOOL X-INGS
OLD HOMES, LEAK ASPI
EXCESS PROPERTY

UTILITIES
CURRENTLY SUE'inc
KERN'S SEWER - NEW LIN
O.H. LINES - LOW W
WATER COMMUN

WIDENING FOR "HIGH T"
BUSINESS TAKE OPERATIONS
O H POWER NORTH SIDE TRANSMISSION
DIST.
MATURE ON 4500
UNDERGROUND INTERCONNECT
U-TURN
WARRENTS FOR SIGNALS
OUTLET LATERALS
RETENTION
R/W
Geom
Review
Best for Large to Mega sized projects
Generally more in-depth
Unlimited number of risk items
Sophisticated Probability and Impact curves
Detailed schedule modeling
Requires detailed knowledge of software
Requires consultant
Assumptions:
1) Lawsuit Mitigation Plan/Team in place
2) Mitigation offer to Plaintiff by 4/05
3) Activities 8 (Negotiation with special interest groups) and 9 (post-ROD negotiation) are cost activities without hard schedule links for the base. Uncertainties associated with each are addressed in the risk register. Milestone 11 (Injunction lifted) may have additional impacts to other activities if the base outcome (injunction lifted) is not realized.
4) Milestone 10 (Injunction Lifted) has no base duration, but is shown to highlight the risk of a new suit not related to the appeal. Impacts of this item are captured in the risk register.
5) Construction activities (20 and 21) include design, construction permits, utility relocation, and other activities that are the responsibility of the DB contractor.
6) Environmental permits (primarily Corps (404)) have been obtained.
7) ROW for the Legacy Parkway is essentially all acquired.
8) Construction work can continue all year (no traditional winter shutdowns, no fish windows, etc.).
9) No utility relocation work is required for the base plan (activities are shown to accommodate risk related to new preferred alternative).
CRAVE

- Best for Medium to Large projects
- Not as detailed
- 24 risk items max
- Simple Probability and Impact curves
- Simple schedule modeling
- Simple to run
- Can be done in–house
CEVP and CRAVE

- Inputs
  - Current plans
  - Current estimate with all contingencies removed
  - Current schedule, both design and construction

- Participants
  - Project team, including PM
  - Outside experts as required
  - Facilitator
CEVP and CRAVE

- Outputs
  - List of risks w/ estimated impacts
  - Tornado Diagram
## Top Cost Risk Factors

<table>
<thead>
<tr>
<th>Rank</th>
<th>Risk ID and Name</th>
<th>Expected Value Cost Impact ($ millions)</th>
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<tbody>
<tr>
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<td></td>
<td>Pre-Response</td>
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<tr>
<td>1</td>
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<td>#N/A</td>
</tr>
<tr>
<td>2</td>
<td>ROW_6. Firestone tire opportunity</td>
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<tr>
<td>3</td>
<td>ROW_13. UIC demo</td>
<td>-$0.38</td>
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<td>4</td>
<td>DES_3. UTAH THRU U-TURNS (PUBLIC; LEGALITY)</td>
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<td>5</td>
<td>CON_2. ADVERTISE W/LIMITATIONS</td>
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<td>6</td>
<td>ROW_8. taquaria opportunity</td>
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<td>7</td>
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<td>DES_7. FENCES/NOISE WALLS</td>
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<td>9</td>
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Pre-Response

Expected Cost Impact ($ millions)
CEVP and CRAVE

- Outputs
  - Probability curves
  - S–Curves
Risk Based Total Project Cost

Probability of Not Exceeding

Risk Based Total Project Cost

Non-Escalated Base Total Project Cost

Escalated Base Total Project Cost

Total Project Cost ($million) - Pre-Response
CEVP and CRAVE

Benefits

- Identifies the greatest risks to the project
- Allows team to focus efforts on highest risk items
- Provides a graphic representation of the project risks
- Good communication tool
Decision Process

Conduct a risk identification workshop at the beginning of the Environmental process using the "Tool for Great Projects". Build on the initial risks identified earlier. Develop a risk register identifying risks in the Design Phase, and the Construction Phase.

Conduct a risk identification workshop at the beginning of the Environmental process using the CREA or CRAVe method. Build on the initial risks identified earlier. Develop a comprehensive risk register identifying risks in the Environmental Phase, the Design Phase, and the Construction Phase.

Conduct a rigorous risk identification workshop at the beginning of the Environmental process using the CEDPR method. Build on the initial risks identified earlier. Develop a comprehensive risk register identifying risks in the Environmental Phase, the Design Phase, and the Construction Phase.

Determine Document Type

Initial Risk Identification

Project Phase?

Design

No

Yes

Design Build?

Yes

B

Start

A

C

Env Complete?

No

Yes

Any potential for controversy (Location, political, etc.)?

Yes

State ES?

No

New Alignment, etc.?

Yes

Sensitive area?

No

Total PV $20M?

Yes

No

Total PV $30M?

Recommend Environmental Phase risk analysis

Technical Risk factors (Urban construction, full depth pavements re-construction, significant underground work, bridges, complex MOT, restrictive limitations)?

No

Review and update the Risk Registry on a Regular basis (recommend bi-weekly).

Update the status of each risk and confirm that the probabilities, impacts, and owner are still correct. Review the risk triggers and determine if any of them have occurred. Identify any new risks. Review the Mitigation strategies. Are they still appropriate or do they need to be revised? Are the strategies working?

At the completion of the Environmental Phase, update the Risk Register and pass it to the Design Team.

Recommend an informal risk identification process. Using the sample risk list as a guide, the project team identifies any risks that warrant special attention.

At the completion of the Design phase update the Risk Register and pass it to the Construction Team.

Obtain existing risk analysis documents from the Environmental phase.

Update existing mitigation strategies and develop new strategies.

The project design team reviews the Environmental phase risk registry and updates the risks as necessary. On more complex projects the design team may want to hold another risk identification workshop to identify new risks unique to the design phase.

Review and update the Risk Registry on a Regular basis approximately every two months or at Milestones.

Update the status of each risk and confirm that the probabilities, impacts, and owner are still correct. Review the risk triggers and determine if any of them have occurred. Identify any new risks. Run the Monte Carlo model and examine the output for risk elements that have increased in potential impact. Review the Mitigation strategies. Are they still appropriate or do they need to be revised? Are the strategies working?

Revisit Mitigation strategies. Are they still appropriate or do they need to be revised? Are the strategies working?

Compare the probability curves (S Curves) for schedule and cost to the estimated cost and the committed advertising date.

At the completion of the Environmental Phase, update the Risk Register and pass it to the Design Team.
How Are We Using This Information?

- Used to determine the adequacy of funding for individual projects
- Used as a tool for selecting a Design/Build team
- Using on individual projects to focus the Project Team’s efforts
- Using as a tool to manage contingency funds during project life-cycle
  - As risks are retired, contingency can be re-allocated
Where Are We Headed?

- Integrating the efforts between Design and Construction
- Develop Dashboards
  - How much risk is the Department carrying?
  - Where is that risk?
# Critical Risk: Mitigation Plan

**Project name:** Redeveloping Inpatient Health Project  
**Risk identified by:** Fu-Wen Chao  
**PM:** Eileen Danson  
**Risk type/source:** Schedule and cost  
**Risk Coordinator:** Project Manager, Financial Coordinator, Construction Coordinator  
**Risk No.:** R128  
**Risk owner:** Construction Manager  
**Open Date:** 5/6/2011  
**Risk Crime:** 0.50  
**Risk Statement:** (3 Cs format - Condition, Cause, Consequence)  
**Impact/Trigger Date:** Construction  
**Max Cost:** 100.5 M  
**Min Cost:** 70 M  
**Most Likely Cost:** 90.25 M

Before the final inspection, another weather related event damages the construction. Fix the damage areas before the inspection, the cost will increase and the schedule will need to be extended to 3 months.

**Closure Criteria/Closure Statement:** The inspection can be finished on time, so the project can keep processing as the schedule. Try to lower the impact to 0.4 or lower in order to maintain the project schedule and cost.

**Closure Date:** 4/4/2013

**Mitigation action (Preventive):**
- **Action:** Research the information about protecting the building under natural disaster such as hurricane or earthquake. Also, make sure the design of the building matches the standard of the environment with natural disaster such as earthquakes.
- **Action Deadline:** 2/14/2013
- **Facilities management equipment**

**Contingency action:**
- **Description:** Work with construction crews, design team and others to fix the damage buildings. Have extra materials on hand.
- **Action:**

Use the chart below to show the risk score before and after mitigation.
Questions and Answers

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