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Event Contingency

Key Points

- Event contingency reflects the included budget amounts required to cover the potential cost associated with either a singular risk event or a combination of risk events that a project may face.
- Including event contingency provisions in price is the least effective way to deal with event risk.
- Avoidance strategies can include eliminating the possible event risk by changing the parameters of the project or project execution methodology.
- Risk events with a high probability of occurring are typically included in cost contingency versus event contingency.
- Where schedule related liquidated damages are present, adequacy of float takes on even greater importance.
- Optimism bias must be challenged and special attention paid to low probability, high impact events.

Introduction

Event contingency is an event, such as an emergency, that may—but is not certain to—occur. This Executive Insight focuses on this important element of an engineer's or a constructor's price. While event contingency is often considered from a provider's perspective, it is equally important from an owner's perspective in order to understand probable project costs, the event-related uncertainties a project may face, and strategies to best manage any emergent risks.

In this Executive Insight, six elements involved in event contingency are examined:

1. Various financial components of a project's price
2. Event contingency as distinguished from cost contingency
3. Preferred method of addressing event contingency from a provider's perspective
4. Potential event risks warranting consideration (event risk checklist)
5. Events typically excluded from event contingency
6. Modeling of event risk in large complex projects

1. Components of a Project's Price

A program/project's total cost to an owner includes the sum of all individual projects/contracts comprising the owner's overall program (project) plus owner retained costs and risks. Risks retained

include risks not transferred; white space risks between projects/contracts; systemic risks including those associated with coupling and correlation; and event risks.

From the perspective of a single project provider (engineer/contractor), price (the amount the owner is to pay subject to fulfillment of an agreed to scope and within defined terms and conditions) may be considered as including the following elements:

- Cost
    - Including allowances for scope development and productivity
- Escalation
- Cost contingency
    - Considering cost ranges for various cost elements and subject to a consolidated Monte Carlo Analysis
- Foreign exchange allowances for international projects or cost of hedges
- Event contingency
    - Mitigated exposure from event risks assumed by the contract and subject to a consolidated Monte Carlo Analysis
        - Assumed risk distribution requires special attention on large complex projects
- Revenue reserves
    - Associated with warranties and yet unearned incentives

This Executive Insight focuses on event contingency.

2. Event Contingency vs. Cost Contingency

There is a tendency in many programs/projects for either the owner or engineer/contractor to use a singular contingency amount (say 10 percent) applied to the most likely cost. This does not reflect the inherent differences between cost contingency and event contingency. Combining cost and risk event contingency in a singular Monte Carlo simulation results in a lower overall contingency for the project.

Cost contingency is not covered further in this Executive Insight, but a few key points are worth noting:

- Most likely costs tend to be optimistic.
- Estimate quality is improved by considering lowest likely cost, most likely cost, and highest likely cost and providing all three “thought out” values into the Monte Carlo analysis.
- High probability risk events (say greater than 90 percent) should be treated as actual costs and included in the cost contingency analysis instead of an event contingency analysis. They should be maintained, however, by the risk manager and actively tracked and managed.
- Common underlying assumptions (cost of steel for example) should be tested for sensitivity on overall contingency levels. These correlating assumptions should be actively tracked throughout the project.

As contrasted with cost contingency, event contingency reflects the included budget amounts required to cover the potential cost associated with either a singular risk event or a combination of risk events that a project may face.

In developing an event risk management strategy, it is useful to begin by considering the unmitigated exposure for individual risk events. Often this will represent the maximum exposure an engineer/contractor may experience, but examples abound where these assumed maximum exposures were far less than actually experienced. Therefore, caution is required.

Examples of some (likely) maximum exposures from unmitigated risks include:

- Maximum schedule liquidated damages (LDs).
    - Either limited by contract or provider's assessment of maximum possible schedule delay (examples of significant delays well beyond those assumed include the $57 million LD on Washington State SR 99, the Big Bertha project).
- Maximum rework cost associated with a variety or performance or supply issues.
- Maximum plant (project deliverable) performance risks and associated LDs.
    - Associated with operating and technical performance of the plant, including reduced output and any revenue loss risks assumed.
    - From an owner's perspective, these represent retained risks from a financing perspective such as what one sees in traffic and revenue shortfalls in public private partnerships (PPPs).
- Maximum warranty costs associated with poor project performance.
- Maximum exposure to unpaid change orders.

By understanding the maximum unmitigated exposures of the various event risks, an appropriate management and mitigation strategy can be developed. It is the mitigated event risks (and costs of mitigation included in the base cost estimate) that is used when calculating the event risk contingency to be provided.

3. Preferred Method of Addressing Event Contingency

Including event contingency provisions in price is the least effective way to deal with event risk. Preferred strategies are avoidance and/or transfer. Avoidance strategies can include eliminating the possible event risk by changing the parameters of the project or project execution methodology and leaving the risk with the client in its entirety. Transfer strategies can include partial or whole transfer of risks within the provider's domain either to the owner or third parties. Examples of transferring event risk in part to the owner would be through limitations on LDs or sharing of the costs of certain risks with the owner where actions by both parties, together, are essential for effective risk management and mitigation.

4. Potential Event Risks

Event risks may be segregated in many different ways. One effective starting framework used in considering international development and construction projects is the ESPRIT framework. The ESPRIT framework comprises:

- Economic
- Social
- Political
- Religious
- Intellectual/Ideas
- Technological

Potential event risks are reflected in Table 1, organized using the ESPRIT framework. Risks that may be retained in whole or in part are indicated and should be considered typical and unmitigated.

Table 1
Potential Event Risks

Category	Subcategory	Potential Event	Retained/ Assumed by Engineer/ Contractor	Retained/ Assumed by Owner/ Government
Economic	**Market Development Slower Than Projected**	Slower General Economic Growth		X
		Changed Priorities		X
		Longer Gestation Time		X
	Market Rates Lower Than Projected	Higher Price Sensitivity		X
		Increased Competition		X
		Free Government Alternate/Price Caps		X
	Reduced Market Share	Delayed Project Completion		X
		Increased Competition		X
	Synergistic Opportunities Fail to Emerge			X

Table 1 Potential Event Risks				
Category	**Subcategory**	**Potential Event**	**Retained/ Assumed by Engineer/ Contractor**	**Retained/ Assumed by Owner/ Government**
	Finance – Cost of Money	Interest Rate Risk	X	X
		Inflation/Deflation Risks	X	X
		"Credit Risk"	X	X
	Finance – Cost of Currency	Absence of Long-Term Local Financing	X	X
		Foreign Exchange (F/X) Risk on Construction Financing	X	X
	Cost risk – Construction Phase			
	Scope	Poorly Defined or Incomplete	X	X[1]
		Reference Standards	X	
		Interfaces Not Well Defined	X	X
		Responsibilities Not Defined	X	
		Limitations due to changed conditions not well defined	X	
	Schedule	Labor Volatility/Work Stoppages	X	
		Changed Work Rules	X	
		Labor Productivity	X	
		Timeliness of Inputs/Approvals/ Permits	X	
		Linkage to Timely Payments	X	
		Weather and Environmental	X	
		Government Action	X	

[1] Spearin Risk

Table 1 Potential Event Risks				
Category	**Subcategory**	**Potential Event**	**Retained/ Assumed by Engineer/ Contractor**	**Retained/ Assumed by Owner/ Government**
		Stakeholder/ NGO (non-governmental organization) Action	X	X
	Budget	Labor Cost Growth	X	
		Materials/Supplies Cost Growth (availability; supply chain costs)	X	
		Inefficiency (management; labor skills; means & methods)	X	
		Additional Taxes and Fees	X	
		Increased Financing Costs	X	
	Terms & Conditions	Expropriation (Land; equipment & materials)	X	X
		Changes in Law (corporate; tax; staffing/ visa/ employment)	X	X
		Force Majeure	X	
		Conflict between local/ regional/ national laws	X	X
		Defaults (government; owner; contractor; subcontractor; local partner; bonding company; banks; insurance company)	X	X
		Payments (mobilization; retention; progress)	X	
		Bonds (availability; default)	X	
		Dispute Resolution (jurisdiction; form; obligations during dispute)	X	

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Category	**Subcategory**	**Potential Event**	**Retained/ Assumed by Engineer/ Contractor**	**Retained/ Assumed by Owner/ Government**
	Quality	Poor workmanship by manufacturers and suppliers	X	
		Inadequate QA/QC	X	
		Poorly Defined Performance/ Acceptance Standard or Process	X	
		Incomplete Documentation	X	
		Environmental	X	
	Cost Risk – Operations Phase			
	Service Scope	Battery Limits of Project/Scope	X	
	Performance Standards	Reliability; Availability; Maintainability	X	
	Operating Cost	Labor Costs (Wages; benefits; mandates; pension; termination)		X
		Energy (availability; cost)		X
		Consumables (availability; cost)		X
		Maintenance Costs (excessive wear; skilled labor; new technology)		X
		Insurance (availability; cost; security related costs)		X
		Uninsured Risks (environmental; political or labor strife)		X
		Tax		X

Table 1 Potential Event Risks				
Category	**Subcategory**	**Potential Event**	**Retained/ Assumed by Engineer/ Contractor**	**Retained/ Assumed by Owner/ Government**
		Performance Bonds (increased cost; reduced availability)		X
	Changes in External Environment	Defaults	X	X
		Change of Government		X
		War		X
		Natural Disaster	X	X
		Boycott or Embargo	X	X
		Currency Devaluation	X	X
		Inadequate Financial System Capacity	X	X
		Corruption	X	X
		Expropriation	X	X
		New Technology	X	X
		Force Majeure	X	X
		Inadequate System Core Capacity	X	X
Social	**Culture**	Cross Cultural Issues	X	X
	Ethics	Bribery	X	X
		Corruption	X	X
		Use of Agents	X	X
		Whistleblower	X	X
		Political contributions	X	X
	Extreme Health or Safety Event[2]	Extended Safety Shutdown	X	X
Political	**Change of Government**		X	X
	Sequestration		X	X
	Exclusivity		X	X
	Changes in Fiscal Policy		X	X

[2] COVID-19 would be an example

Table 1 Potential Event Risks				
Category	**Subcategory**	**Potential Event**	**Retained/ Assumed by Engineer/ Contractor**	**Retained/ Assumed by Owner/ Government**
	Changes in Law	General	X	X
		Project Specific		X
	Approvals	Development		X
		Project (right of way; environmental; construction)	X	
		Import/export	X	
		Operating	X	X
		Repatriation of Profits	X	X
	Adverse Government Action/ Inaction		X	X
	Regime Change			X
	Provision of Utilities/ Other Services		X	X
	Increases in Taxes	General	X	X
		Project Specific	X	X
	Political Force Majeure	Civil strife; terrorism; conventional war; WMD (weapons of mass destruction)		X
	Termination	Owner's Concession	X	X
		Contract	X	
	Payment Failure by Government			X
	Property Rights	Clear title/ lease	X	X
		Easements	X	X
		Intellectual property rights (IPR)	X	X
	Ownership of Assets		X	X
	Structure of Project Securities			X

Table 1 Potential Event Risks				
Category	**Subcategory**	**Potential Event**	**Retained/ Assumed by Engineer/ Contractor**	**Retained/ Assumed by Owner/ Government**
	Availability of Securities Market			X
	Insolvency by Government or Concession Company		X	X
	Changed Conditions on Foreign Ownership or Operation		X	X
	Enforceability of Legal Rights		X	X
Religious	**Tensions/ Increased Intolerance**		X	X
Intellectual /Ideas	**Corporate Social Responsibility**	People Related (Modern day slavery; child labor; indigenous peoples; social outreach)	X	X
		Environmental Related (Climate Change (Net Zero Carbon; Embodied Carbon); Zero Discharge)	X	X
	Corporate Governance		X	X
	Evolving Political Form			X
	Homeland Defense			X
	International and Local Pressure Groups		X	X

Table 1 Potential Event Risks				
Category	**Subcategory**	**Potential Event**	**Retained/ Assumed by Engineer/ Contractor**	**Retained/ Assumed by Owner/ Government**
	Globalization vs Unilateralism			X
	Access to Knowledge		X	X
Technology	**New Technology**	Scale	X	X
		Capacity Building	X	
		Intellectual Property	X	X
		Time to Deployment		X
		Learning Curve (Failure rates; system environment)	X	
		Social Acceptability	X	X
		Export/ Import Controls (Controls/ Licenses)	X	X
		Tax & Duty Environment	X	X
	New Applications	Learning Curve	X	X
		Environmental Factor Effects	X	X
		Transferability of Lessons Learned	X	
		Social & Economic Framework	X	X
		Supply Chain Extension	X	X
	Scale	Scalability	X	
		Replicability	X	
		External Resource Requirements	X	X
		Unknown Unknowns Growth	X	X
	Capacity Building	Institutional	X	X
		Management	X	X
		Specialized Expertise	X	X
		Craft/Technician	X	X
		Maintenance		X

Table 1 Potential Event Risks				
Category	**Subcategory**	**Potential Event**	**Retained/ Assumed by Engineer/ Contractor**	**Retained/ Assumed by Owner/ Government**
		Supply Chain	X	X
		Supporting Infrastructure	X	X
	Intellectual Property	Patent; Trademark; Copyright; Usage; Royalty & License; Counterfeiting	X	X

5. Events Typically Excluded from Event Contingency

Risk events with a high probability of occurring, say 85-90 percent or more, are typically included in cost contingency versus event contingency. They should still be retained on the owner's or project risk register as appropriate and actively managed.

Certain elements of event risk are typically considered outside of the engineer's or contractor's control and are excluded from event risk, but only to the extent they are clearly indicated as remaining with the owner in the contract. Examples include:

- Client caused delays such as delayed authorization to proceed (outside any contractually indicated window); delayed client approvals to initiate various elements of work due to no fault of the contractor; delayed receipt of client furnished materials or equipment or client required out-of-sequence work
- Client requested project acceleration or slowdown
- Scope changes
- Certain legal or regulatory changes (these need to be well bounded and described)
- Client costs
- Consequential damages beyond any agreed to liquidated damages
- Undisclosed, uncharacterized, or not readily quantifiable (at time of contract) hazardous materials and substances
- Human remains[3]
- Third-party delays (contractor may agree to assume certain delays with respect to approvals, right-of-way acquisition, and utility relocations)
- *Force majeure* (beyond an agreed minimum number of days)

[3] This was a specific exclusion requested by the contractor associated with the early and enabling works at the World Trade Center rebuild.

6. Modeling of Event Risk in Large Complex Projects

Event risk may have both cost and schedule impacts and each needs to be modeled. Event risk mitigation strategies need to consider both cost and schedule. Schedule mitigation is aided by adequate float within the schedule and the adequacy and robustness of contingency execution plans and management.

In instances where schedule related liquidated damages are present, adequacy of float takes on even greater importance.

Modeling of event risk, especially on large complex projects, must consider several important factors:

- Coupling of event risks whether by common assumptions, risk drivers, or constraints. For example, a global financial crisis would severely impact several elements of both cost and event risk. A similar coupling has been associated with COVID-19.
- Correlation among tasks, such that delay or cost growth on one results in delay or cost growth on other tasks. This results in a greater impact from event risks than is typically modeled (typically modeled with zero correlation among event risks, whereas evidence suggests 30 percent correlation may be a better assessment.)
- Assumed distribution in any Monte Carlo analysis. Evidence suggests that large complex systems behave with a “fat tail” behavior. Distribution selection should be carefully considered.
- Low probability, high impact events must be considered and reflected in the event risk assessment.
- Optimism bias must be challenged, especially when defining low and high-end contingency estimates for each of the various event risks.

Summary

Event risks are real and have a significant impact on overall project cost performance. Optimism bias must be challenged and special attention paid to low probability, high impact events and their modeling. While one begins with an assessment of unmitigated event risks, it is important to understand the strategies available to limit the effects of these risks. These include:

- Avoid – walk away from the project!
- Transfer
- Manage

This last strategy should be employed even when avoidance and transfer are believed to have occurred. All too often these first two strategies have proven to be less complete than believed.

About the Author

Bob Prieto was elected to the National Academy of Construction in 2011. He is a senior executive who is effective in shaping and executing business strategy and a recognized leader within the infrastructure, engineering, and construction industries.