Any views and opinions expressed in this article may or may not reflect the

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, v Z] P Z • š o] l o Ç } • š v ‰ Œ } À]] v P o o š Z Œ ^ š Z } µ P Z š } µ š _ 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

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:

- xEconomic
- xSocial
- xPolitical
- xReligious
- xIntellectual/Ideas
- xTechnological

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.

Table1
Potential Event Risks

Category	Subcategory	Potential Event	Retained/ Assumed by Engineer/ Contractor	Retained/

Table1 Potential Event Risks				
Category	Subcategory	Potential Event	Retained/ Assumed by Engineer/ Contractor	Retained/ Assumed by Owner/ Government
	Quality	Poorworkmanship by manufacturers and suppliers	X	
		Inadequate QA/QC	X	
		Poorly Defined Performance/ Acceptance Standard o Process	X	
		Incomplete Documentation	X	
		Environmental	X	
	Cost Riskt Operations Phase			

Table1 Potential Event Risks				
Category	Subcategory	Potential Event	Retained/ Assumed by Engineer/ Contractor	Retained/ Assumed by Owner/ Government

Table1 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	K Á v Œ [• } v ••	X	X
		Contract	X	
	Payment Failure by Government			X
	Property Rights			

Table1 Potential Event Risks				
Category				

Table1 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 Environmen	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

Table1 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 95 percent or more, are typically included in cost }vš]vP v Ç À Œ•µ• À vš }vš]vP v ÇX dZ Ç •Z}µo •š]oo Œ š]v } register as appropriate and actively managed.

Œš]v o u vš• }(À vš Œ]•l Œ šÇ‰] ooÇ }v•] Œ }µš•] }(šZ 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
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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,