

## Predictable Projects in a World of Black Swans

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### A Tale of Two Cities

"It was the best of times; it was the worst of times ..."  
(Charles Dickens, *A Tale of Two Cities*)

By most popular measures, it is "the best of times" for the energy industry. For most owner/operators, revenue and profit are at all-time highs; and for investors, opportunities abound. According to the IEA, worldwide investment in energy infrastructure is projected at \$20 trillion between now and 2030<sup>(1)</sup>.

And yet, in other ways it is "the worst of times". Consider a recent report from Booz Allen Hamilton<sup>(2)</sup> indicating the majority of energy industry executives:

- Are dissatisfied with project performance (40% of capital projects overrun) – and this level of dissatisfaction is the highest ever.
- Agree that poor project performance is not acceptable when the market expects predictability and strong returns.
- Accept that they cannot afford to miscalculate project risks, yet they do not have a good grasp as to how to manage them.

While there is no shortage of examples, Shell's Sakhalin II project is instructive. A huge and complex oil and gas production project at Sakhalin Island (off the east coast of Siberia), the project was sanctioned in 2003 at \$10 billion (a value that exceeded Shell's net income for the prior year). Two years later, with the project well into construction, Shell issued a 6K report announcing the cost had doubled to \$20 billion (today it is \$22 billion).

One does not have to look far for other examples. Many projects in the Canadian oil sands have experienced 50 - 100% cost overruns as have numerous offshore developments. Infrastructure projects, such as the "Big Dig" (from to \$2.6 billion to \$14.6) have had similar performance.

There is a growing recognition that something is wrong with the way project costs are predicted, risks assessed, and investment decisions made. How is it possible that highly experienced owners and contractors can find it so difficult to predict project costs? Why is it so difficult for an industry that routinely overcomes daunting technical and logistics challenges to find a way to improve the understanding of project risks and the processes we use to manage them?

The Black Swan may provide some answers.

### Black Swans and Capital Projects

The concept of the Black Swan is described in a book of the same name by Nassim Nicholas Taleb.



He defines a Black Swan as an event meeting three criteria<sup>(3)</sup>:

- It is an outlier as it lies outside the realm of regular expectations
- It carries extreme impact
- Human nature makes us concoct explanations for its occurrence, after the fact, making it seem explainable and predictable.

Taleb devotes much of his book to explaining our "aggressive ignorance" of the presence of Black Swans – why we are so confident of our data, analytical methods, and decision processes that we systematically exclude the possibility of such risks from consideration. In fact, he demonstrates that the more extensive our data and sophisticated our analytical techniques, the more likely we are to miss the things that are most important.

Could poor project performance be explained by our tendency to ignore Black Swans? Although no cost overrun is without the requisite retroactive explanations, research<sup>(4)</sup> suggests the most common cause is that the project was underestimated in the first place. Projects are normally estimated "bottom up", based on the assumption that everything goes according to plan. This practice ignores outliers, resulting in chronic underestimation of project time and cost.

Improving project predictability requires that we hunt for outliers, i.e. Black Swans. By providing an independent perspective, and a process not anchored to the deterministic estimate & schedule, Risk Resolution™ facilitates the exposure of Black Swans.

## The Risk Resolution™ Process

Improving project predictability requires us to find Black Swans (i.e., understand all the risks), and then manage their impact. Risk Resolution™ achieves this with the five sub-processes shown below.



### **Risk Framing:** Hunting the Black Swans

Taleb suggests that finding Black Swans requires looking at a project from a fresh perspective – one that is not anchored to our assumptions and analyses. Risk Framing is therefore zero-based, using scenario – type analyses to frame risk scenarios and their potential impacts.

Risk Framing is performed early in Feasibility, well before definitive plans and estimates are available. The objective is to provide an early indication of the nature and severity of project risks to enable effective risk management. Effective risk management requires executive – level (as opposed to project-level) attention and authority in order to address the strategic nature of outliers.

Risk Framing begins with Risk Discovery, a process that combines checklists, research and interviews with key knowledge holders to identify and assess project risks and required mitigations. Since Risk Framing is not anchored to a definitive estimate, a proprietary probabilistic model is used for the analysis.

The deliverables from Risk Framing include:

- **Risk Exposure:** the predictable financial impact of all project risks.
- **Risk Balance Sheet:** a financial, monetized risk register that includes mitigation metrics.

### **Risk Strategies:** Caging the Black Swans

Black Swan risks usually cannot be eliminated. But, if we can identify and understand them, we stand a good chance of managing them. We call this “caging” the Black Swan and it refers to developing strategies that avoid the risk entirely, mitigate the impact if it should occur, or provide the funding for risk coverage.

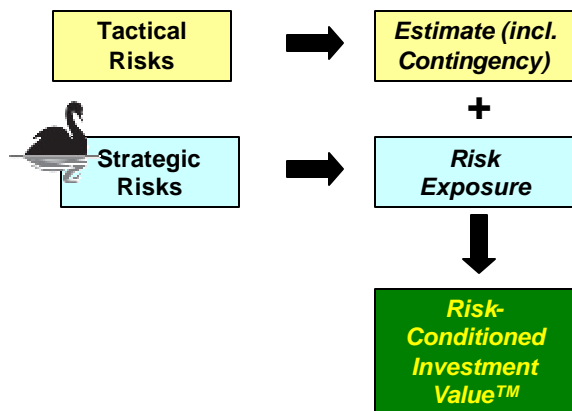
This process begins with the results of Risk Framing, and is focused on plans to address strategic risks to better assure a predictable outcome.

### **Risk Assessment:** Understanding the Black Swans

Once a comprehensive cost estimate and schedule are available, (usually early in Definition) comprehensive Risk Assessment can begin. The objective is to develop a probabilistic analysis of capital cost and schedule, reflecting both tactical and strategic risks, so that the **Risk-Conditioned Investment Value™** (RCIV) can be determined.

The RCIV represents the predictive outcome of the project, considering the financial exposure from Black Swans. It is a financial, “top-down” view of the project value.

The Risk Resolution™ process segregates risks: Tactical Risks are variations to the deterministic estimate; Strategic Risks are the outliers; i.e. the Black Swans. The development of RCIV is illustrated below.



### **Risk Brokering:** Feeding the caged Black Swans

With project risks transparent to all parties, the process of Risk Brokering can begin. For projects requiring finance or financial agreement among partners, this provides the “honest broker” to independently and objectively allocate risks or risk cover.

**Risk Validation:** Taming the Black Swans

As the project enters the Execution Phase it is important to remain vigilant – both in terms of ensuring that the known Black Swan risks are being managed in accordance with the plan, as well as in monitoring conditions for periodic updating of Risk Scenarios and the Risk Exposure.

The Financial Risk Exposure is likely to be a substantial sum requiring rigorous stewardship, and the Risk Balance Sheet provides the means. The Risk Balance Sheet is the aggregation of “T-accounts for each major risk element as illustrated below.

<b>Net Mitigation Benefit</b> (Mitigation Benefit less Cost of Mitigation)	<b>Value of Risk</b>
<b>Risk Funding</b>	<b>Net Risk Exposure</b> (If any)

- Value of Risk considers both the cost impact and the probability of occurrence.
- Net Mitigation Benefit considers the cost of any mitigation steps and their likely impact.
- Risk Funding is the amount included in the RCIV to cover this risk.
- Net Risk Exposure is the balance.

A Risk Dashboard may be used for reporting changes in the risk background and overall risk-driven trends likely to impact the Risk Exposure. CAPEX VaR™ techniques can be applied to manage strategic risks across the project portfolio.

## Summary

There is general agreement that capital project predictability must be improved. Doing so requires fresh thinking. The Black Swan concepts provide a useful way to address what may be the fundamental cause of lost predictability: the lack of processes and governance to identify strategic risks.

The Risk Resolution™ process provides independent facilitation and transparency so that stakeholders can get the perspective needed to identify and proactively manage the Black Swans that threaten project outcomes.

## About the Authors

Keith Dodson and Richard Westney are co-developers of the Risk Resolution™ Process, a service of Westney Consulting Group. Founded in 1978, Westney Consulting serves the energy industry with services focused on project risk management, strategic planning, organizational effectiveness and effective project execution. The company has been applying the Risk Resolution™ Process to upstream, downstream, and alternative energy projects since 2003.

Long a leading executive in the engineering and construction industry, *Keith Dodson* began his career as a cost engineer with Brown & Root, rising to President of Brown & Root Engineering & Construction International. He subsequently held top executive positions with other leading contractors both in the US and overseas, as well as with a major power producer.

Mr. Dodson served as Chairman of the Construction Industry Institute and of the Engineering Foundation of the University of Texas at Austin. He is a member of the National Academy of Construction and an instructor at the Construction Executive Program at the University of Texas. He is a graduate of the University of Texas at Austin as well as the Advanced Management Program at Rice University.

*Richard Westney, PE, PMP* formed Westney Consulting Group after serving in the Project Management Division of Exxon Research and Engineering Company. Author of 5 books on project management, he has served as visiting faculty at Texas A&M University, and at the Norwegian University of Science and Technology, as well as an instructor for executive programs at Texas A&M, Stanford, and the University of Texas.

A Fellow and Past-President of the Association for the Advancement of Cost Engineering (AACE International) Mr. Westney also received AACE's highest honor, the Award of Merit. He currently serves on the Executive Board of the Engineering & Construction Contracting Association (ECC). He holds a BS in Mechanical Engineering from the City College of New York, an MS in Management Science from Rensselaer Polytechnic Institute, and is a graduate of the 3-year Owner/President Management Program at Harvard Business School.

## References:

1. *World Energy Outlook 2006*, International Energy Agency
2. *Capital Project Execution in the Oil & Gas Industry*, Booz Allen Hamilton, 2006
3. *The Black Swan*, Nassim Nicholas Taleb, Random House, 2007
4. *Megaprojects and Risk*, Bent Flyvbjerg, Cambridge University Press, 2006