

Improving the Predictability of the CAPEX Portfolio

Spring 2009

If the whipsaw of product price and project cost over the past 12 months has taught anything, it is that everyone has been making investment decisions without a full understanding of the risks involved. This is certainly true for major capital projects.

Predictability for major projects has never met expectations; this was a significant executive-level concern long before the rapid escalation in costs from 2005 – 2008. Today, that concern is more acute; in most owner companies CAPEX is severely constrained, and managers must deal with tough questions as to which projects to defer, cancel, initiate or renegotiate. With fewer projects going forward, failure is clearly no longer an acceptable option.

This paper describes some important lessons learned about why so many major energy and infrastructure projects experience cost overruns and delays. These include insights on what has worked, what has not, and what new approaches are required to meet today's higher standards for predictability.

The Problem of Project Predictability is Widespread, Even Among Good PM Practitioners

There is general agreement that energy industry owners and contractors have not been able to reliably predict the cost and duration of their large, complex capital projects. According to a recent survey, 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.

- Accept that they cannot afford to miscalculate project risks, yet admit they do not have a good grasp as to how to manage them.

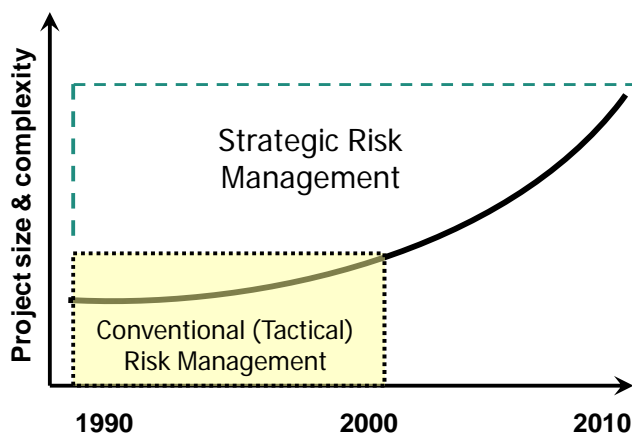
There is good reason for these concerns. Whether it is a huge oil & gas development such as Shell’s Sakhalin II, the oil-sands developments in Canada, infrastructure improvements such as Boston’s Big Dig, deepwater production such as BP’s Thunder Horse, gas production such as Statoil’s Snøhvit LNG, or nuclear power generation such as Finland’s Olkiluoto 3 reactor, the experience of major cost overruns and lack of predictability has been much the same. Surprisingly, these cost and schedule overruns often continued to grow as the project progressed, even right through to completion. This trend was clear long before the rapid escalation in project costs began 2005 and is an even greater concern in today’s economic conditions.

Most of these “mega-wreck” projects were developed, planned and executed by owner and contractor organizations who have decades of experience, hundreds of skilled people, deep technical knowledge and rich sets of project management best practice processes and procedures.

So why did these projects fail? Why do these owners and contractors continue to be concerned about their ability to predict cost and schedule?

LESSON #1: Projects Overrun Because Most Owner and Contractor Organizations Lack a Practical and Disciplined Approach to Strategic Risk Management

The body of knowledge of project management best practices evolved over the past several decades to meet the needs of project teams at that time. However times, and projects, have changed; perhaps the biggest change is in the nature and extent of project risks.



This figure illustrates how conventional project risk management, focused on the risks manageable by project teams, was appropriate for the typical project up to year 2000 or so. But, as projects became larger, more complex and difficult, other, more strategic risks started to dominate and Strategic Risk Management became critical.

There is a rich body of knowledge around the management of project-level tactical risks; this is the conventional body of knowledge of Project Management Best Practices (illustrated by the yellow box above.) It is essential that all project planning and delivery organizations have these competencies.

But, very large, complex and difficult projects and programs require Strategic Risk Management. Here, the body of knowledge (illustrated by the white box above) is almost empty, and new methods are needed.

The failure of most major projects to meet cost and schedule objectives, even when conducted by the world's most experienced owners and contractors, provides clear evidence that the conventional approach to project risk management is insufficient. What these projects need is a fresh approach: Strategic Risk Management.

Understanding Strategic Project Risks

A simple taxonomy allows us to separate project risks into two categories:

- **Tactical risks** – There are two types of tactical risk:
 - *Definition risks* – these risks are associated with the degree of design development and planning definition for the given project scope.
 - *Performance risks* – these risks are associated with normal/reasonably expected variations in owner and contractor performance.

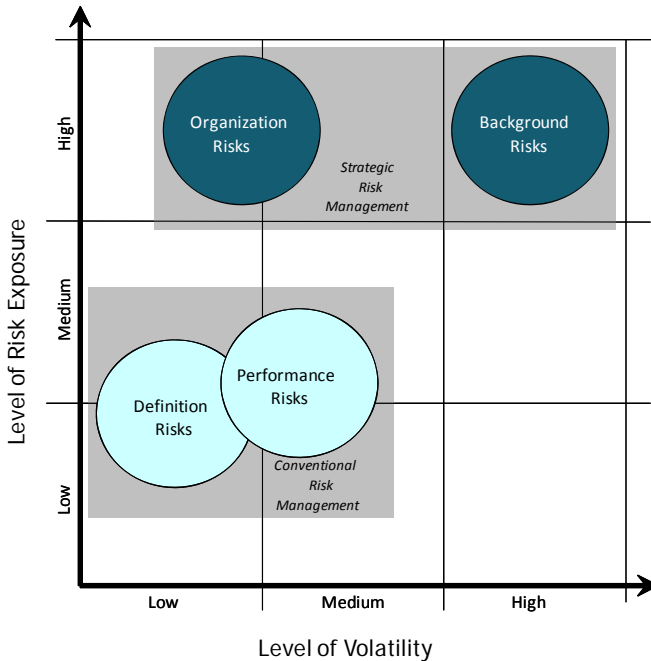
These project –level risks are covered by contingency and managed by the project team. Conventional project risk management techniques, if applied effectively, provide a good solution for identifying, analyzing and mitigating tactical risks.

- **Strategic risks** – There are two types of strategic risk:
 - *Background (external) risks* – These are typically associated with changes in:
 - Scope
 - Market conditions
 - Location factors
 - Commercial or partner requirements and behaviors
 - *Organization (internal) risks* – These risks are typically associated with an asymmetry between the size, complexity, and difficulty of projects and the organization's ability to deliver.

These strategic risks are typically outside the responsibility of the project team (who have neither the capability nor authority to manage them). Therefore they are usually not included in contingency. Strategic risks are often considered outliers and either ignored or “assumed away”.

Strategic risks have a significant *potential impact* on the project’s outcome, which we express as *Risk Exposure*. Since these risks do not necessarily reduce with time, they have and retain significant uncertainty which we express as *Volatility*.

The relationship between risk exposure and volatility provides a new way of looking at project risk which is illustrated here.



Here we can see why so many projects overrun: most organizations focus their attention on Definition and Performance Risks, and give too little attention to the Background and Organization Risks whose level of exposure and volatility are far greater.

LESSON #2: Strategic Risks Do Not Necessarily Improve With Time

In his highly relevant best-seller *The Black Swan*, Nicholas Taleb explores the reasons why financial disasters often occur for reasons which, with hindsight, seem eminently predictable. He defines “Black Swans” as risks that are considered to be outliers and thus ignored until they occur with great impact, at which point explanations are quickly concocted to make them seem to have been predictable.

Conventional practices assume that good project definition, the transference of risk to contractors, setting of “stretch goals” to motivate teams, and the reliance on contingency to cover risk is sufficient to ensure predictability. Furthermore, it is assumed that risk exposure will decrease with time and progress.

This practice is insufficient since strategic risks (many of which can become “Black Swans”) are typically not correlated with time or progress – in fact, their severity may well increase over time. For example, the geopolitical risks impacting an international project can easily increase over the project’s life – indeed, a mega-project in some locations may itself be a driver of political or market risks.

Taleb offers a wide range of explanations as to why well-intentioned, competent professionals ignore significant risks when making plans or critical decisions. Among these is the concept of “Tunnelling” which he defines as “*the neglect of sources of uncertainty outside the plan itself*”. Here is an example of how tunneling can play out on a major project:

- Very early (and usually optimistic) expectations of project cost and time to production are established. Although at this early stage there is little information on which to base these numbers, they effectively define an expectation which anchors all the work that follows.
- As the work progresses, assumptions are made to define a base case to support the early expectation. Deviations from the base case are met with great resistance.
- A design configuration is developed to support the base case is defined. Little time is spent exploring alternatives or testing the underlying assumptions.
- Eventually, when the date of the full project funding decision arrives, the time and effort invested in Front End Loading is considered a primary indicator of the predictability of the cost estimate. If the stage-gate process has been followed diligently, predictability is assumed to be high. All risks are assumed to be covered by project contingency which has been estimated by the project team based on variations to their estimate for risks they can identify and control.

Of course, it is evident that all manner of strategic risks can and will impact this project even though a good faith effort was made to follow what everyone believed to be “best practice.”

Assessing a Project’s Strategic Risk Exposure

Any successful process for identifying and assessing risk exposure must incorporate the following elements:

- Due diligence by experienced people with an independent, perspective to identify all risks to the project including the impact of potential “Black Swans.”
- The ability to identify and quantify potential risk impact during the earliest development phase when risk mitigation and avoidance are most effective.
- A reliable, easily understood risk model that addresses the tails of the probability distribution and that is not anchored to project-level estimates and schedules.

The process of Strategic Risk Management uses a methodology called Risk Resolution® which begins when a project is in its earliest, formative stage and before major business decisions or commercial commitments have been made. The technique used is Risk Framing: a means of assessing strategic risk exposure prior to the creation of a credible cost estimate. Through the use of interviews, surveys and analysis, a Heat Map is created to provide an executive-level overview of the major sources of risk and the possible

mitigation strategies required. Scenarios are created to represent the best- and worst-case outcomes for each type of risk, and then used as input to a purpose-built Monte-Carlo simulation models for cost and schedule that provide a range of possible values for Risk Exposure.

The result is a Risk-Adjusted Cost Estimate and Schedule along with appropriate mitigation strategies. Experience with this technique provides numerous examples of critical, strategic risk-informed executive decisions that would otherwise not have been made.

As the project becomes better defined, the process of Risk Analysis becomes more refined, but the results are similar: the understanding of Risk Exposure provides the basis for a Risk-Adjusted Cost and Schedule which not only lead to improved risk-informed strategies and plans but also can help facilitate financial close.

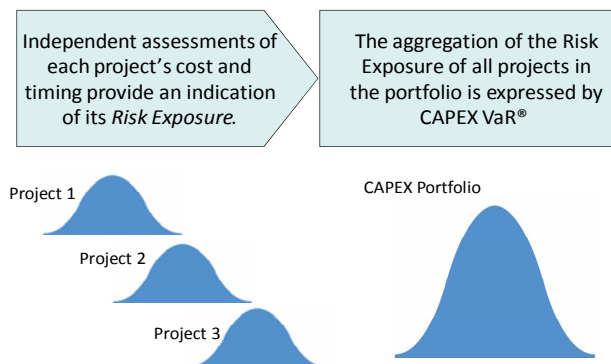
LESSON #3: Strategic Risks Are Managed Across the Project Portfolio

With each project's Risk Exposure understood, it is useful to consider the overall level of risk in the CAPEX portfolio. At the portfolio level, decision – makers need to be able to assess the potential increase in the level of investment required to complete the sanctioned projects in the portfolio, at a given level of confidence. They need to be able to scrutinize the portfolio for off-ramps, exit strategies, and new opportunities to invest. When CAPEX budgets are tight, there is a need to be able to “triage” proposed projects and determine those that best fit the company's overall objectives.

Assessing a Project Portfolio's Value at Risk

The portfolio view of project risk is illustrated by the diagram below.

We have defined the financial provision for a project's strategic risk as *Risk Exposure*: a probabilistic view of the range of possible cost outcomes.



We define the financial exposure to strategic risks across the project portfolio as *CAPEX VaR®*. This provides a probabilistic view of the funding that may be required to complete the projects in the portfolio and it is calculated by a statistical aggregation of the Risk Exposure in each project.

We can summarize the responsibilities across the project portfolio with the diagram shown here. The most significant organizational change is the allocation of responsibility for providing funding and stewardship for CAPEX VaR® to account for the project’s Risk Exposure.

<i>Risk Management Level</i>	<i>Risk Management Focus</i>	<i>Risk Management Funding</i>
Company Management	Portfolio – Wide Strategic Risks	Portfolio CAPEX VaR®
	Project – Specific Strategic Risks	Project Risk Exposure
Project Management	Project – Level Tactical Risks	Project Contingency

Many organizations now are created new accountabilities at levels above the project manager for the project’s overall business success.

Management must also address project – and portfolio – level strategic risks to create a stable environment for project teams to succeed.

Summary

These lessons learned provide the starting point for the fresh thinking required by any organization taking a serious look at how it invests in capital projects. Whether an owner/operator, joint venture partner, or lender, Strategic Risk Management will improve project predictability and performance.

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