How Front-End Loading Creates Overconfidence and Causes Cost Overruns

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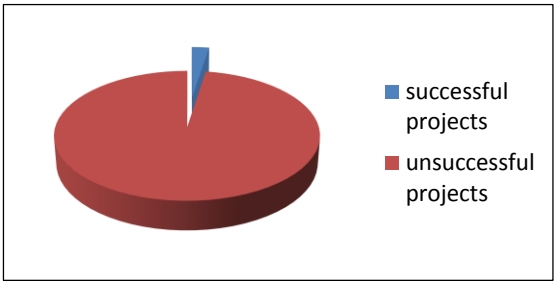
And you all know security is mortals' chiefest enemy.
Hecate, the goddess of witchcraft, speaking to the witches;
Macbeth, William Shakespeare



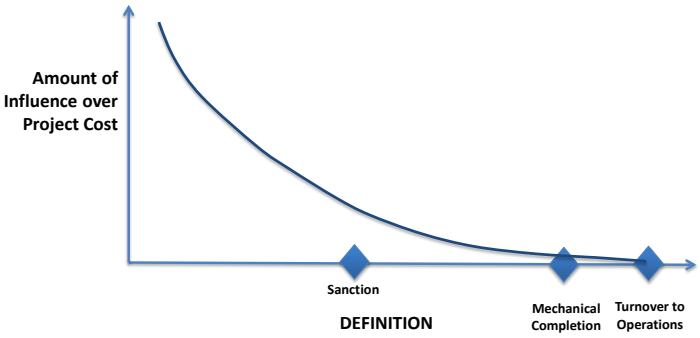
According to a recent survey[1] the number of major projects that could be defined as successful when assessed across the four critical dimensions of scope, cost, schedule, and business benefits was an astonishing 2.5%. How is this possible, when most owners have spent years developing and implementing Front-End loading best practices? Many projects are being funded based on the assumption that, if Front-End loading best practices have been dutifully followed, the cost, time, and economic outcomes are reasonably predictable. Of course, if that were the case, our batting average would be a lot better than 25.

So what is the problem here? Could it be that Front-End Loading best practices provide a false sense of security for the investment decision-maker? The best practices which are considered sacrosanct today evolved in response to the project environment of 20+ years ago. *Not only do they fail to address many of the most critical risk and success factors of today's mega-projects, what is even worse is the tendency to believe that, by following them, predictable outcomes are assured*. This article will provide an overview of why this is so, and suggest some new ways of thinking.

We begin by examining how much of current best practice is based on the assumption that project definition is the primary driver of cost outcomes.

THE INFLUENCE CURVE

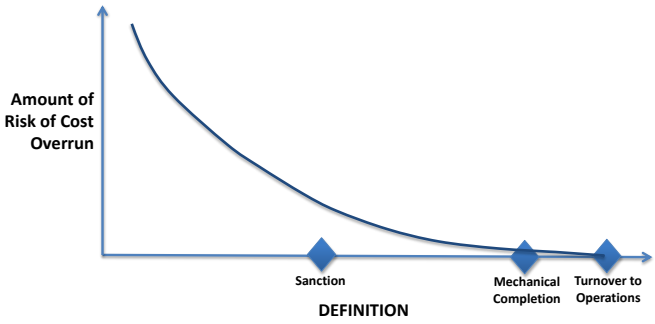
Everyone regards the Influence Curve, shown here, as the foundation of all the best practices associated with Front-End Loading. No one can argue with its basic premise: the ability to influence a project's final cost is greatest in the "front-end" period prior to sanction.



The basic assumption of the Influence Curve is simple: as the degree of project definition increases, the amount of influence over the project's outcomes decreases. This is what leads to the principle of Front-End Loading: the more completely a project is defined, the less likely it is to experience cost overruns.

ESTIMATE CLASSIFICATION SYSTEMS

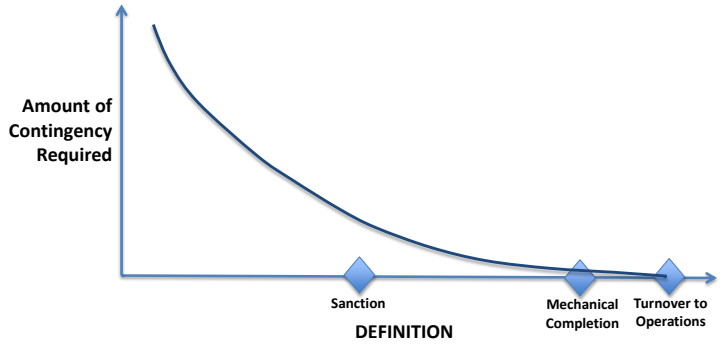
Since the acceptance of the Influence Curve, it has become generally accepted that the risk of cost overrun is directly correlated to the degree of project definition; the greater the project definition, the more accurate the cost estimate.



AACE International (the Association for the Advancement of Cost Engineering) has a widely-used Recommended Practice for a Cost Estimate Classification System[2] that provides an expected accuracy range for each class of estimate (e.g., +/- 15%), the class being based on the level of project definition. This provides an easy, shorthand way to communicate where a project is and how accurate the cost estimate is. Many owners have developed their own, similar classification systems which are relied upon to communicate cost overrun risk at each gate.

CONTINGENCY LEVELS

Best practice requires that an appropriate level of contingency be included in project cost estimates, to account for likely variations in the design parameters, quantities, pricing, or execution plan. It is generally accepted that the amount of contingency that is required in a cost estimate is a function of the degree of definition. Certain contingencies are often associated with each estimate classification.



OWNER'S PERCEIVED RISK EXPOSURE

A quick scan of these three curves shows their consistency: *they are all based on the degree of project definition*. As a result, it has become generally accepted that the owner's exposure to cost overrun risks follows the same trend: highest at the start, acceptable at sanction, and decreasing steadily until turnover is completed.

It is no wonder that everyone in the organization wants to believe this. Gatekeepers, project sponsors, and project managers naturally expect that the payoff for all of the time, effort and investment in the Front-End Loading process is a level of risk exposure at sanction that is low enough to justify funding the project. But is this confidence warranted? Could it be that all these best practices have actually

created a false sense of confidence and that the risk exposure at sanction is actually a lot higher than everyone thinks?

Clearly something is wrong here, as statistics clearly show that, even when projects are well-defined at sanction, cost overruns are likely to occur.

We do not dispute the validity and importance of the Influence Curve, Estimate Classification Systems, Contingency Levels, or all the best practices associated with Front-End Loading. Nor do we suggest that organizations should stop following them. We do, however, dispute the notion that project definition is the primary predictor of predictable cost outcomes, and that, simply by following FEL best practice, predictable outcomes are assured.

Westney experience suggests that risk exposure is determined by a lot more factors than project definition. To understand these factors, we must rethink the entire concept of risk exposure and how it changes over the project life-cycle. This rethinking is required in three areas:

1. The amount of control
2. The organizational and external sources of risk
3. The compounding of risks during execution

Each of these is discussed below.

1. *Rethink Risk Exposure by considering the amount of control*

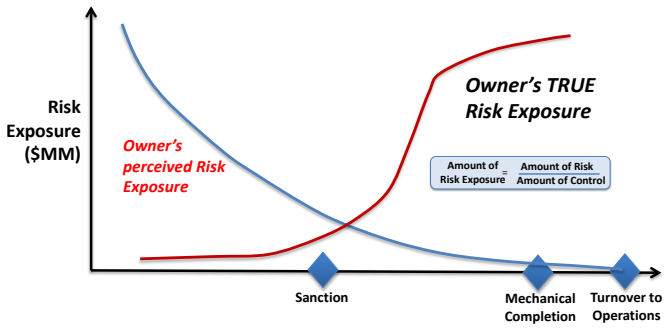
The conventional definition of the expected value of a given risk is the product of the potential loss and the probability of occurrence. But this ignores perhaps the most important factor: the amount of control, i.e., *the extent to which the parties can influence the potential loss and/or the probability of occurrence.* Clearly, the more control you have, the lower your the Risk Exposure. Consider the definition of Risk Exposure shown below.

RISK EXPOSURE = **Potential Loss ($) x Probability of Occurrence (%) x 1/Control Factor**

When we think about Risk Exposure this way, an entirely different picture emerges.

- During Front-End Loading: Since the work of Front-End loading is mostly reimbursable engineering services, the level of expenditure is very low relative to the total project cost, and the level of control relatively high. Therefore: Risk Exposure = LOW.
- During Execution: Soon after sanction, contracts and purchase orders are signed and the level of commitment and expenditures go up rapidly. Generally, contractors and suppliers increasingly have the upper hand as the owner becomes more and more committed to the project. At this point, the time and cost of contract disputes are likely to have a greater impact on the owner's project economics than the amount of money in dispute. As a result, the owner's risk increases rapidly while degree of control becomes progressively less. Therefore: Risk Exposure = MODERATE increasing to HIGH.

The curve shown here compares the Owner's perceived Risk Exposure (based on conventional best practice) compared with the Owner's true Risk Exposure as described above. The idea that risk exposure at sanction is relatively low, and can be expected to decrease during execution, clearly does not recognize the realities of the transfer of influence and control from owner to contractor during execution.



Note that we do not dispute the Influence Curve, to the contrary, it is precisely because the Influence Curve is correct that risk exposure is higher after sanction, when control (i.e., influence) is much less.

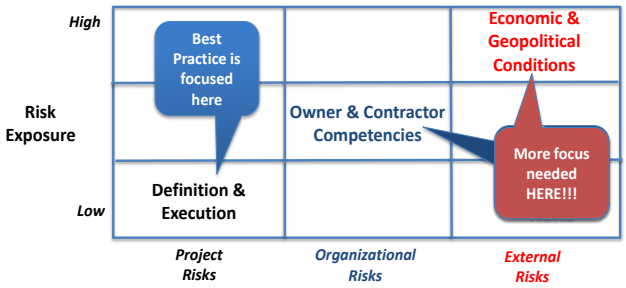
The idea that Risk Exposure is a function of the degree of control is even more relevant when we consider all drivers of project risk.

2. *Rethink Risk Exposure by considering organizational and external sources of risk*

We noted that best practice focuses primarily on project definition as the driver of risk. But, clearly, major projects today have many more types of risk to consider; in fact, project risks can be considered in three broad contexts as illustrated here.

- **Project Risks** are the focus of conventional project risk management, addressed by risk registers etc., and generally covered by contingency. The project manager and team typically have the capability and authority to manage these risks.
- **Organizational Risks** focus on the ability of the owner, JV partner, and contractor organizations to provide the competencies needed to execute the project plan and meet cost and time objectives. The demands of major projects, together with the industry's loss of experienced staff and high levels of market activity, combine to make this an important issue, yet one that is often not addressed, particularly where owner capabilities are concerned. Project managers often do not have the authority or capability to drive the organizational changes needed to address these internal risks.
- **External Risks** focus on the environment in which the project takes place; i.e., the global economic conditions, market conditions specific to goods and services for projects, geo-political trends, location access and conditions, etc. These are often "assumed away" in cost estimates since they are difficult to predict and a project team has limited ability to address them.

Applying the concept of Risk Exposure as a function of degree of control to these three categories of risk, we see that, since project risks represent a relatively low potential loss and project teams have a high degree of control, that the Risk Exposure is low. Organizational risks can have a major impact, but the organization also has a high degree of control, so risk exposure is medium. Of course, external risks have high impact and relatively low levels of control, so Risk Exposure is high.

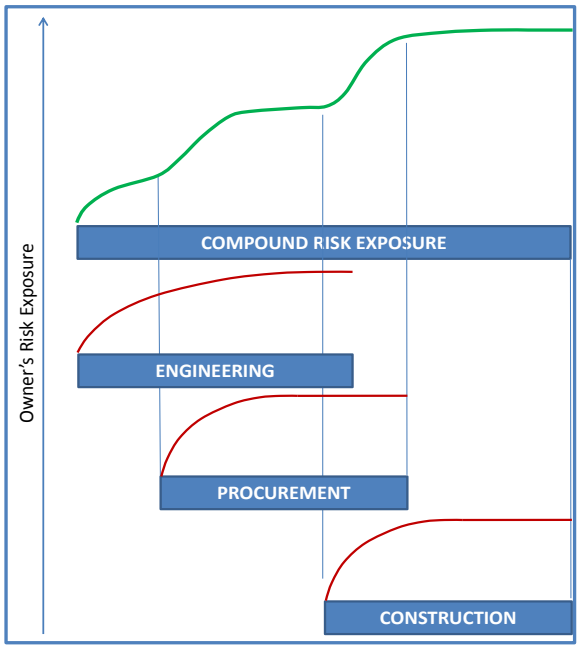


This matrix also illustrates the problem with conventional risk management: by focusing primarily on project definition (over which control is high) conventional best practice places too little emphasis on organizational and external risks which is where the greatest exposure lies. This chart illustrates the need to increase the focus in these areas. Note that organizational and external risks tend to manifest themselves during execution, another reason why owner's true risk exposure increases significantly after sanction.

3. *Rethink Risk Exposure by considering compounding risk exposure during execution*

Project teams all recognize the "knock-on effect" of execution schedules. They focus on those engineering tasks whose slippage will delay the procurement of critical equipment, thereby causing delays in construction and jeopardizing the completion date. Although each of these phases will likely have its own schedule, an integrated, project master schedule is a good way to account for the knock-on effect between them and the cumulative impact on the completion date.

Less well-recognized is the knock-on effect of execution risks. Using the concept of risk exposure as described above, it can be seen that engineering, procurement and construction each have their own risk exposure profile reflecting the amount of risk and control over time. For example:



- Engineering typically has risks associated with productivity, management of change, and location factors. We can see the owner's risk exposure building up slowly as the detailed engineering progresses.
- Procurement typically has risks associated with pricing and commercial terms, timely production of vendor drawings, quality and delivery lead times. We can see the owner's risk exposure building up rapidly as purchase orders are let.
- Construction typically has risks associated with labor availability and productivity, site access and conditions, and the quality of supervision. Again, the owner's risk exposure builds up rapidly as contracts and subcontracts are committed to.

But these risks are not independent. Unmitigated engineering risks are themselves a risk to procurement. For example, the risk of poor management of change creates a risk of delayed and inefficient procurement processes. Likewise, the risk of poor vendor quality or extended delivery times has a profound impact on construction productivity. All of this results in a compounding of the owner's risk exposure as shown in green.

SUMMARY

The Influence Curve, Front-End Loading (FEL), and Estimate Classification Systems all contribute to the widely accepted notion that the owner's capital project risk exposure is highest at the beginning, and (if FEL best practices are followed) sufficiently low at sanction, such that execution risks can be transferred to contractors and predictable outcomes assured.

Since a majority of major projects fail to meet their objectives, there is clearly something wrong with this concept. Instead it must be recognized that, when the degree of control over risk is considered along with risk probability and impact, owner's risk exposure is actually quite low during FEL and increases rapidly after sanction. Risk exposure during execution is increased still further when organizational and external risks are considered, as well as the compounding effect of project level risks.

An important improvement to current best practice begins with understanding true risk exposure, communicating this effectively at the sanction gate, and developing project- and risk-management strategies to optimally allocate risk between owner and contractor.

References:

1. *Need to know: Delivering capital project value in the downturn*, PriceWaterhouseCoopers 2009
2. *AACE International Recommended Practice No. 18R-97: Cost Estimate Classification System*