



## White Paper 2012-25

### Fundamental Insights on Minimizing Complex Project Risk for a Single Project

*In the White Paper [2012-11](#) "Take Risks, but Take Risks the Right Way: Reframing the Opportunities and Risk Process for Complex Projects", we showed what the main drivers of the risk of Complex Projects are interdependence of contributors and deliverables, and natural variability in the schedule. What are then the actions that can actually best improve significantly project execution risk? This fundamental paper describes ground-breaking insights about risk management, and how they can be applied practically.*

#### Two systemic levers to diminish project risk

The previous paper [2012-24](#) "The True Risk of Complex Projects" explains the particular drivers of project outcome variability, and their statistical properties. Project outcome variability becomes a risk when it leads to decreased profitability, or delayed delivery.

Complexity in the project stems from the interdependence of a large number of contributors; and variability of the project's outcome stems directly from the natural variability of the delivery from each of these contributors. Moreover, the interdependence of the contributors increases the overall variability of the system, and tends to make it more skewed toward undesirable outcomes, instead of damping it like it would happen if all its components would be independent.

**These fundamental insights show us what are the two levers that can be used to decrease the risk in large, complex projects in a systemic way:**

- **Decrease complexity;**
- **Minimize the natural variability of the delivery from the contributors, or, if not possible, its effects.**

#### How can we decrease system complexity?

Decreasing complexity leads to consider the following three action paths:

- Decreasing the number of contributors and the number of levels / ranks of contributors;
- Minimizing their inter-dependencies, both in number and in criticality;
- Increasing the level of control on the contributors to improve their alignment.

Decreasing the number and the number of levels of different contributors should be achieved by:

- Fostering suppliers' consolidation so that risk on variability can be transferred to a lesser number of first rank suppliers that are more fully in control of the subordinate contributions;
- Minimizing, as much as possible, avoidable internal interfaces (between offices, departments, business units) – thus, for example, the integrated project team concept

which is indeed an efficient complexity minimization solution.

Minimizing contributors' inter-dependencies should be achieved by:

- Minimizing the number of convergence points in the project (where the contributions of many contributors need to meet simultaneously), and generally, try to make the project more linear;
- Minimizing the number of different contributors required for one particular convergence point;
- Minimizing inter-dependencies by protecting the convergence points with a schedule buffer which aims to minimize the domino effect of inter-dependency on the rest of the project.

Increasing the level of control on the contributors should be achieved by:

- Implementing interface management systems that are coordinated / moderated by one central party only, instead of relying on natural interfacing between contributors;
- Ensuring alignment with the interests of the project through alignment sessions held regularly at the highest level.

A note is needed here on the industrial policy that follows the need to reduce the number of contributors. There has been a tendency in the industry for owners to try to minimize the number of suppliers they deal with directly, increase the suppliers' responsibility and transfer them more risk, or even share risks and opportunities. This strategy only succeeds in diminishing complexity (and hence, the overall risk for the project) if these first rank suppliers consolidate lesser rank contributions. If they are just there as an additional interface and still need to coordinate the activities of the same number of lesser rank contributors, complexity will rather increase. Industrial consolidation thus needs to be sought at the same time as minimizing the number of direct suppliers. This explains why the policy of less first rank suppliers is not always successful, as demonstrated by many examples, e.g. the Boeing 787 Dreamliner project being held up by the failure to deliver of Alenia (one of the composite sections manufacturer), although Boeing had fostered partnership with a much limited number first rank suppliers that share risk and opportunities on the project.

This also explains why successful project organizations often keep managing by themselves hundreds of

suppliers on a given project: it gives them more control, and decreases complexity, rather than seeking to limit the number of direct suppliers, and add another layer of interfaces. A consolidation policy in the industry is not easy to implement when the scopes of projects change significantly from one project to the other, thus the types of suppliers change also significantly.

### How can we decrease the effects of natural variability of the duration of an activity?

Natural variability of activities and processes is a fact of life; there are ways to minimize it, but it will never be possible to avoid it completely: unexpected events will always happen.

Let us note first that variability of an activity is different from mistaken forecast of durations. However in project environment where many activities that are performed are unique, inaccurate forecasts can be the cause of significant disruption. In order to minimize the possibility of poor forecasts, primordial approaches involve the use of:

- Experienced people or organizations that can accurately predict the level of effort and durations needed, if possible based on proven historical data;
- Proven technologies, avoiding as much as possible Research and Development type activities.

Supposing now that the initial forecast duration of the activity is reliable, variability of delivery will still happen around that forecast due to a variety of reasons. Our possibility of action on variability depends of the level of control we can have on the activity. Activities that are managed directly are generally more easily controllable than subcontracted ones. Hence, variability control actions will involve the following gradation, depending on the level of control:

- Progress follow-up on a detailed breakdown of sub-activities and interventions in the form of changes in resource levels as soon as deviations are observed;
- Various incentives to meet the forecast durations (penalties for late delivery, less often complemented by incentives for early delivery)
- Buffer protection (allowances) outside the activity for those activities that cannot be directly controlled. The buffer size will depend on the level of control and uncertainty.

Lastly let's not forget that variability offers opportunities: too often we can't grab the opportunity of an activity that finishes earlier than expected, because we are not organized to do so!

### Preventing massive failures of low probability

A major insight of our new understanding of complex projects risk is the primordial role of low probability, high consequences events that often drive of the overall risk. Preventing as much as possible these events needs to be a key focus. And this issue is generally not addressed by traditional project risk management. This particular process will be developed in detail in another White Paper. The key principles are:

- Multiple lines of defence – several independent failures are needed for a large consequence to happen;
- Chasing for possible common causes of failure, and making the delivery more resilient to them;
- Limiting the possible impact of a failure through specific contingency plans and investments.

### A full spectrum of risk mitigation actions

The actions mentioned in this paper participate to a full spectrum of actions in terms of scale and timeframe.

They span from long term, massive structural actions on the supplier base to the short term minute actions on the resourcing of a sub-activity. Hence, proper comprehensive risk management needs to be tackled at different levels in an organization; from a structural policy level at the highest corporate

level to minute actions at project level.

### Conclusion: how pragmatic risk mitigation approaches are finally explained

Many of the practices described in this paper are practices which we know are being applied pragmatically by seasoned project managers and organizations, based on their experience. Because we now understand how they participate to diminish project risk, these practices can be applied in a much more systematic and conscious way. In particular, those actions that aim at decreasing complexity and that aim at preventing major events of low probability are areas where considerable improvements can easily be brought in organizations, because they are not really considered at present. Even small improvements in those areas can have distinct consequences which will directly impact the consistency of success and, ultimately, the financial results of your organization.

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