White Paper 2012-12

Estimate Your Actual Risk Level in a Project: the PVD Risk Level Formula

A simple yet robust and powerful framework for opportunity and risk management in large, complex projects has been described in the paper 2012-11 "Take Risks, but Take Risks the Right Way: Reframing the Opportunities and Risk Process for Complex Projects". In addition, Project Value Delivery offers here a valid quantitative risk measurement system for complex projects. It is simple, and it is extremely powerful and easy to use by the project leader as a decision tool.

The basic formula

As we now know, the main opportunities and risks in a complex project are mainly related to the project convergence; and convergence planning gives a monitoring tool: the buffer monitoring. Refer to White papers 2012-03, 2012-04 and 2012-11.
The opportunity or risk can then be valued considering:

- the remaining time to the convergence point (T);
- The available buffer (B) between the production of the deliverable and the convergence point (positive or negative);
- the buffer relative change with time in the last time periods (dB/dT). If the buffer has diminished by a half month in the last month, dB/dT=-0.5; if dB/dT=0 the buffer is unchanged; so if dB/dT<-1 the system is ultimately diverging, as the buffer is diminishing by more than one month every month;
- and the running cost of the project in terms of expenditure at its maximum activity point (RC$).

T, B and RC$ are expressed for the same reference period span, for example a month.

Using these notations, the slippage of the end of the activity at the end of one period is dB.

We can show that an extrapolation of the current rate of buffer change is that we anticipate that we will miss the convergence point if (T-B) / (1+dB/dt) > T, and the amount we will miss it will be (T-B) x (1+dB/dt) - T. This quantity is infinite if dB/dt=-1; and should be so if dB/dt<-1 as the system diverges in that case.

The following formula could then be applied:
Level of risk impact LRI($) = RC$ x [(T-B) x (1+dB/dt) – T], if dB/dT>-1; LRI($)=∞ if dB/dT≤-1.

In the case where the chain of activities leading to the deliverable has not been started, there will be no progress, the buffer will not change, and dB/dT=0 (the buffer remains the same). As long as the expected buffer is positive, there will not be a risk. However, it is important to identify that even later deliverables can be linked to early activities and thus, should be updated from very early on in the schedule reviews.

Examples for a project peak running rate of RC$=30M$/month, a time to the convergence point of T=6 months and a buffer B=3 month, and:

- if relative buffer change is dB/dT=-1 (the end of the activity is one month later every month), the activity will never converge, and the risk is infinite;
- if the relative buffer change is dB/dT=-0.5 (half a month delay every month), the calculated risk level is 0, convergence should occur exactly on the expected date.
- If dB/dT=-0.25 (three weeks delay every month), the calculated risk level is 180M$ as we can expect the activity to finish 6 months later than expected.

Because it is a monetary value, this formula also gives a general order of magnitude of the level of resources that could be invested in avoiding this risk to materialize. Typically investing now up to 5-10% of the amount is a good investment!

The values that will be calculated using this formula will be high; in reality they would be mitigated by such actions like reallocation of resources etc; however while it would diminish the direct cost, the cost of disruption associated is often hidden but significant. We believe that this formula will be useful for the project leader because:

- it highlights the criticality of convergence and buffer consumption
- it highlights to the organization the significant amount of risks and opportunities involved.
- It gives a simple measurable index that can be used for prioritization of actions.

Actual usage on a project with multiple convergence points and multiple deliverables for each convergence point

A complex project will have multiple convergence points and multiple deliverables for each convergence point, as per the convergence plan.

For one particular convergence point:

- T is the same for all deliverables
- B and dB/dt will be different for each deliverable

- The convergence point LRI is the maximum LRI of all deliverables. This is based on the fact that the latest deliverable will drive the overall convergence point schedule.

Once you have computed the LRI of each convergence point, the total project LRI is the sum of all the LRI (because being late on a convergence point will imply to be late on the later ones).

The formula produces a prioritized action list

The ranking of each convergence point and deliverable LRI's will directly give a prioritized action priority list.
Generally, convergence points that are later will have low LRI because there is scarce data about the production of the associated deliverables, or they have not been started anyway. So, the LRI ranking will generally, appropriately highlight actions to be taken for convergence points located in a closer time frame.

Frequently asked questions

Why do we use the peak expenditure of the project for all convergence points, and not the actual project expenditure rate at that point? It creates a huge impact for the early convergence points!

This is very intentional. Project leaders tend to dismiss delays on early engineering gates as the rate of expenditure at that stage is limited. Yet when you think about it, delays at that stage will have consequences that will span along all the project duration: late or poor quality specifications for procurement; delays in fabrication, etc. We believe that even for an early gate, the actual total consequences should relates to the entire project as an appropriate measurement of the disruption.

The calculated risk level fluctuates widely during the project execution

That's quite normal and that's why this formula should not be used for financial reporting purposes. It is aimed to create the right level of attention, of prioritization, and of action. As soon as a critical deliverable will be out of pace, the risk level will shoot up, a red light will prompt the project leader and her management to take action.
One acceptable way to diminish fluctuations that would not be real would be to average the change in buffer (dB/dT) over a relevant number of time periods if that was appropriate due to the quality of the reporting data: sometimes, there is not a good data every time period, and it might be needed to average dB/dT over two or three time periods to get realistic values.

My project is in fact like a program with different sub-projects that are quite independent. What rate of expenditure should I use?

Only if the sub-projects are effectively independent in their execution can you use individual's sub-projects maximum expenditure rates. As a program manager you will still get a prioritization of deliverables across all your sub-projects.

What does negative LRI mean?

A negative LRI means that there is a significant opportunity to grasp. Don't miss it and reinforce the opportunity. Finishing a convergence point early will give you a lot of opportunities and recognition, and will show in your project results.

Conclusion: an actionable framework

Through a simple framework focused on the right drivers of your project, the PVD approach to opportunity and risk management is a breakthrough for large, complex project management. It is highly actionable; it is focused and intrinsically prioritizes actions and focuses the attention; it values risk and opportunities at their real order of magnitude.
Try it, you'll be surprised by the result.