White Paper 2013-08

Black Swan Schedule Management: Is Your Project Going to Be Late? Well, it Will Be Even Later than you Forecast!

Nassim Nicholas Taleb, the famous author of "Black Swan", makes a strong point in his book about the fallibility of planning when it comes to projects in a complex world. And shows how the probability of the duration of a complex project is nothing but a long tail curve with astonishing practical consequences for the project leader: the more your project is late, the more late you can expect it to be beyond what you think!

The "Black Swan" book by Nassim Nicholas Taleb is a well-known reference when it comes to the effect of complexity in today's world. In effect it is a manifesto about the unpredictability of complex systems – and generally, it denounces our excessive arrogance in believing we are in control, in particular regarding our tendency to issue predictions on fundamentally unpredictable situations. In the book, Taleb makes some interesting points in particular regarding projects. What can we learn for large, complex projects?

> **For complex projects, our "intuition" that if we are late, things should sort themselves out and converge is wrong. It will get worse!**

The Planner's tunnel vision

The first point Taleb makes is that project planning is an activity which has very limited validity. Of course, this is because complex systems are inherently unpredictable. Furthermore, Taleb points to the particular effect of tunnel vision: project planning is most often done as if the project was an isolated endeavour, not taking into account external events and sources of uncertainty outside the plan. In Taleb's words, "*we are too narrow-minded as species to consider the possibility of events straying from our mental projections, but furthermore, we are too focused on matters internal to the project to take into account external uncertainty, the* 'unknown unknown*" so to speak*".

Thus, project leaders and planners "*view the world from within the model*" and often miss key connections with the outside world that might in fact be the actual drivers of the project delivery.

An interesting exercise would be to systematically brainstorm what are the actual assumptions underlying a project schedule when it comes to events external to the project – and make sure the situation is reassessed as soon as one of these assumptions becomes invalid.

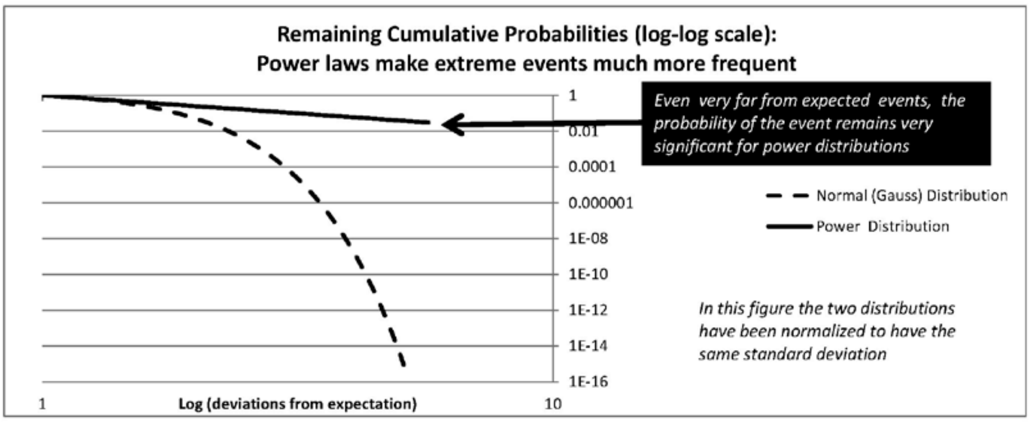
Project Delays are from 'Extremistan'

Because complex projects are indeed operating in a complex world, project delays do not behave in the intuitive way we have constructed from our Industrial Age normal law statistics; they behave with a 'long tail'. This has quite some fundamental effects, in particular it becomes impossible to mitigate risk through a portfolio of projects because risk will not cancel out - there will always be some projects which failure will dominate the entire system (refer to our White Paper 2012-24 "*The True Risk of Complex Projects*").

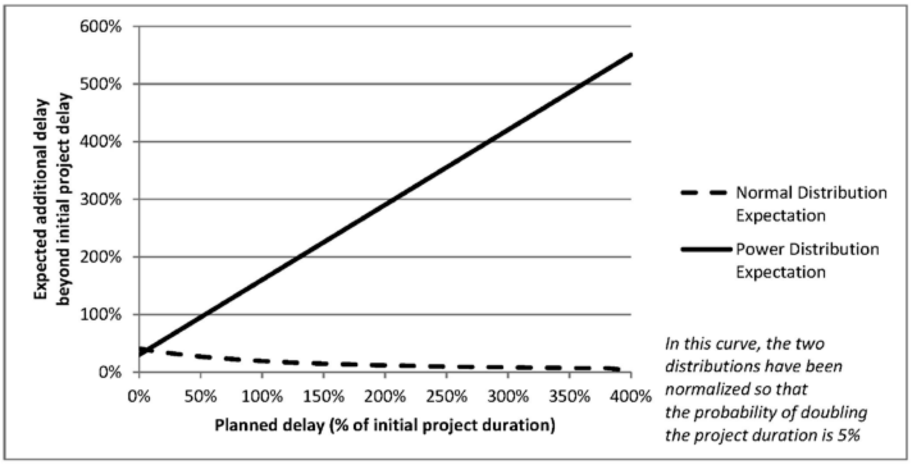
In this area, Taleb proposes an interesting based on 'long tail' considerations. Considering that project delays follow a 'long tail' law, we can conclude the following: if a large, complex project looks like it will be delayed by one month it might only be a few additional weeks late; but if it looks to be one year late, it will probably be late by a few additional years. In other words, the long tail effect is that the more the project looks delayed on the plan, the more we can expect it to be delayed in reality – the system is not converging. "*The longer you wait, the longer you will be expected to wait*"

The long tail approach

Taleb proposes to consider (in a first approximation) that project duration probabilities follow a power-law (an usual pragmatic, observed behaviour of complex systems). It is a long tail approach – the probabilities of having very significant deviations from the initial expected duration is much, much higher than with a normal distribution the further one goes from the initial expected duration.



Assuming a probability power law with an exponent which fits with the same standard deviation as our normal distribution project duration model, we actually can compute the mathematical expectation of delays depending on the actual observed delay (note 1). While for a normal distribution it decreases when the actual delay becomes greater, it increases for a power distribution. What does this mean? If your project duration was to follow the usual bell curve, if you find yourself to be late, the additional delay to be expected will diminish the later you are. In reality, in complex systems, the delay to be expected will increase the later you are!!



In this curve, the two distributions have been normalized so that the probability of doubling the project duration is 5%

The PVD rule of thumb in project delays

Hence for large, complex projects, our "intuition" that if we are late, things should sort themselves out and converge is wrong. Here is a simple rule of thumb we are using with our clients for highly complex projects:

- If you are planning to be 1 month late, expect at least 1 to 2 months <u>additional</u> delay (beyond what you believe right now),
- If you are planning to be 6 months late, expect to be at least an <u>additional</u> 6 months to one year late,
- If you are planning to be 1 year late, expect to be at least 1 to 2 <u>additional</u> years late,
- Etc.

Of course this only applies to complex projects involving many different contributors. For straightforward projects, less extreme rules of thumb will apply. However projects are always more complex than they seem, so better err on the side of caution.

Learn to cut your losses when a project starts going astray!

Stock markets are an excellent example of a complex, unpredictable system. In spite of a lot of gesticulation, it is fundamentally impossible to predict anything about its evolution. Amateurs always hope it will get better and stick to their stocks waiting for it to 'come back to normal'. On the other hand, professionals know it is a complex system. Thus when they see that stocks start behaving significantly in the wrong direction, they will cut their loss – better taking a small loss now than probably a much larger loss later.

Based on the dynamics of complex systems, project organizations should do the same: when they start seeing that a project goes significantly astray, it means that it will most probably become a disaster. It would be much better to cut your losses right now than to hope that things will get better. Yet because of sunk costs, the fact that project managers tend to believe they are in control, and other psychological effects, this almost never happens. Let's face it: today most project organizations are amateurs in the field of complex systems.

Conclusion: expect the worst when you start deviating

Cutting losses by stopping before it is too late might be the only way to save your company in these cases

In complex systems, intuition is not necessarily a good counsel and it is better to expect the worst when a project starts deviating significantly from its expected duration or cost. Cutting losses by stopping before it is too late – or alternatively benefiting from a great contract protection – might be the only way to save your company in these cases. In this paper we have given a useful rule of thumb about what to expect when project delays are observable compared to the initial plan. We use it in our consulting work and find it extremely useful. It will give you a powerful and simple way to estimate the actual final effect of a failing project. You might not believe it. Be try it, it works – and it is supported by actual mathematical theories on complex systems.

Note 1 *– Let us suppose that the project duration probability is* $f(x)$. *The conditional expectation of x, knowing that x exceeds a, is*

$E[x|x>a] = \frac{\int_a^\infty x f(x)dx}{\int_a^\infty f(x)dx}$. *If f(x) is a power law, E increases with a. If f(x) is a normal distribution, E diminishes when a increases..*