Managing Schedule Risks

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Smart People – Brilliant Results

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The hope that risk can be "programmed" out of a project schedule is a false hope. However, you can manage uncertainties by understanding the risk types they represent, and addressing each in an appropriate manner. In part two of this risk management series, an aerospace program manager explains. In *Against the Gods: The Remarkable Story of Risk*, author Peter Bernstein states that one of the major intellectual triumphs of the modern world is the transformation of risk from a **matter of fate** to an **area of study**. And so, risk analysis is the process of assessing risks, while risk management uses risk analysis to devise management strategies to reduce or ameliorate risk. Managing the uncertainty in a network of tasks that describe a schedule is the topic of this article.

Risk Buy–Down Activities

Risk buy–down tasks are just like any other task in the plan. The role of these tasks is to manage the uncertainty in the project. The term uncertainty has a broader meaning than risk. Project planning involves uncertainty. This uncertainty can be characterized by:

1. **Uniqueness** – a project is a unique undertaking. This does not bode well for the management of technical or programmatic risk, since there is little, if any, historical data by which to calibrate the models describing this risk.
2. **Variability** – there are various tradeoffs between performance, cost, schedule, quality and risk. A model of these tradeoffs requires that the correlation between each of the elements of the model be known in some way.
3. **Ambiguity** – a state that emerges from the lack of clarity and structure as well as the built-in biases of estimating cost, schedule and risk.

Although mature organizations use many tools to support project planning, quantifying the uncertainty in these plans is not as common. The PMBOK Guide identifies risk as a key area of concern, but does not describe the management of the underlying uncertainty that results in this risk. Transforming project risk into project uncertainty often requires that the concept of risk as an event ignore the source of risk emerging from the probabilistic nature of the project's technical and programmatic activities.

The concept that uncertainty and risk can be programmed out of the schedule is a false hope. Intrinsic variation pervades all natural systems. Observe or measure any characteristic of anything, and the result will vary from instance to instance. Plan or measure a task-duration, or a cost associated with that task, and a natural variance will appear. Management gurus Walter Shewhart and W. Edwards Deming taught that reacting to random changes in the system as if they mean something always degrades the process.

But first let's put some bounds on the term uncertainty. There are four kinds of uncertainty in projects and corresponding mechanisms to address them.

Identifying the Risk Mitigation Tasks in the Plan

Planning for risk management starts after risks have been identified and assessed. Risk Analysis makes use of a variety of mathematical models to evaluate the effects of choices of risk and mitigation. Risk Analysis also determines the sensitivity of risks to changes in independent and dependent factors described in the plan.

Table 1. – There are four types of variation in a project's technical and programmatic variables. Two are simply part of the ether and are present in any normally operating project. Two are unforeseen and unforeseeable variations. The first two must have explicit mitigations and the last two will cause the plan to be reevaluated when they appear.

Variation Type	Mitigation For This Variation Type
The normal variations that occur in the completion of tasks arising from normal work processes. Deming has shown that these uncertainties are just part of the process and attempts to control them, plan around them, or otherwise remove them is a waste of time.	Fine-grained assessment points in the plan verify progress. The assessment of these activities should be done in a 0% or 100% manner. Buffers and schedule margin are inserted in front of the critical activities to protect their slippage. Statistical process control approaches forecast further slippage.
Foreseen uncertainties that are identified but have uncertain influences.	Creation of contingent paths forward are defined in the plan. These on ramp and off ramp points can be taken if needed
Unforeseen uncertainties are events that can't be identified in the planning process.	When new problems appear new approaches must be developed
Chaos appears when the basic structure of the project becomes unstable, with no ability to forecast its occurrence are the uncertainties that produced	Continuous verification of the project's strategy is needed. Major iterations of deliverables can isolate these significant disruptions

The actual schedule (a network of tasks) has two types of uncertainty. These are orthogonal from the class of uncertainty shown in **Table 1**.

- Static uncertainty which is uncertainty about a specific parameter.
- Dynamic uncertainty which are the stochastic in the underlying environment.

The static uncertainty needs to specifically address the mitigation tasks in the plan. If *X occurs, I'll deal with it by doing Y*. This type of schedule risk planning should be embedded in the baseline plan. Making these risks visible it demonstrates explicit mitigation steps.

A dynamic uncertainty needs to be addressed in a different manner. The first step is to determine the probability distribution of these dynamic uncertainties. This does not mean the specific shape of the probability distribution function - that should be done for the static uncertainties - but the likelihood of occurrence profiles. This can be done through a risk classification scheme. An example of such a scheme is shown in **Table 2.**

For this approach to be effective, classification levels need to be calibrated to match the vocabulary of the project. Then the percentage overruns need to be calibrated to the class of project.

Next Steps

Using the risk classifications in **Table 2**, the explicit risk mitigation tasks (risk buy down) can then appear in the schedule as discrete activities in the same way any business work activity that delivers business value.

With these risk mitigation activities in place, the next steps include:

1. Identify probabilities for the various durations for risky activities in the plan and the durations of the mitigation activities.
2. Assessing the risk adjusted completion dates for the deliverables defined in the schedule.
3. Assessing the impact of these risks and the mitigations on the cost and schedule described in the activity network.

With these steps, the network of activities can then be considered *Credible* from a programmatic risk point of view.

Table 2. – The ordinal classification of risk needs to have descriptions meaningful to the reader. The ordinal values should not be numeric. This avoids the temptation of performing arithmetic on the risk raking.

	Classification	Uncertainty	Overrun (%)
A	Routine, been done before	Low	0 to 2
B	Routine, but possible difficulties	Low to Medium	2 to 5
C	Development, with little technical difficulty	Medium	5 to 10
D	Development, with some difficulty	Medium to High	10 to 15
E	Significant effort with technical challenge	High	15 to 20
F	No experience in this area	Very High	25 to 50