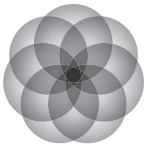
// Measuring Risk Exposure through Risk Range Certainty (RRC)

Overcoming the Shortcomings of Schedule Confidence Levels

Dr. Dan Patterson, PMP
CEO & President, Acumen

October 2009



ACUMEN
Proven Project Analytics

+1 512 291 6261 // info@projectacumen.com

www.projectacumen.com

Table of Contents

Introduction

This paper discusses the use of an alternate risk exposure metric called Risk Range Certainty (RRC). This metric has been developed due to risk reporting biases resulting from focus on risk confidence level and Joint Confidence Level (JCL).

Schedule confidence level is often used as a risk indicator and recently, Joint Confidence Level (JCL) has evolved from this to tie both cost and schedule risk exposure together. However, in practice, schedule confidence level and JCL suffer from a schedule risk characteristic known as **merge bias** that causes these metrics to be heavily skewed towards the pessimistic. As such, when using a JCL as a target, we are potentially setting ourselves up for failure by targeting a goal that is extremely difficult to achieve. This paper discusses how Risk Range Certainty (RRC) can be used to overcome this issue and provide a more realistic and true picture of project risk exposure.

Traditional Risk Metrics

First, consider three risk metrics: confidence level, contingency and Joint Confidence Level.

Confidence Level

Confidence level is the probability of achieving a given target (typically a given finish date or target budget cost). In isolation of each other, confidence levels have some value in determining risk exposure, yet all too often can give misleading results.

Schedule confidence level has a major flaw: CPM schedules inherently carry low confidence levels somewhat irrespective of the project's risk level. The reason is this:

A sound CPM schedule will contain a single start milestone, a single finish milestone and potentially multiple paths in between with at least one (longest) path known as the critical path. Each and every one of the various paths through the CPM network ultimately has to converge through to the completion milestone. As a result, when risk analysis is conducted on a CPM schedule, the probability of all of the various paths leading to the completion milestone coming in on time is small – this is known as **merge bias**. It is analogous to a coin toss. Consider an experiment where we are tasked with tossing a coin five times and asked the probability of landing five consecutive heads. The result is not 50% but instead 50%*50%*50%*50*50% or 3.125%. Likewise, if our schedule has only five parallel paths in it, even with, say a symmetrical +/- 10%, range of uncertainty, the chance of all these paths not impacting the finish milestone is again well down in the single digits. Reporting a 3% confidence

on a project whose activities have been risk loaded with an equal chance of being early or late is hard to defend. As such, schedule confidence level should be used with caution. Experience with tens and tens of major CAPEX projects each containing several thousand activities has shown that a schedule confidence level of between 10 and 20% is quiet reasonable yet this percentage would normally (yet perhaps falsely) ring alarm bells with a project manager or company board room.

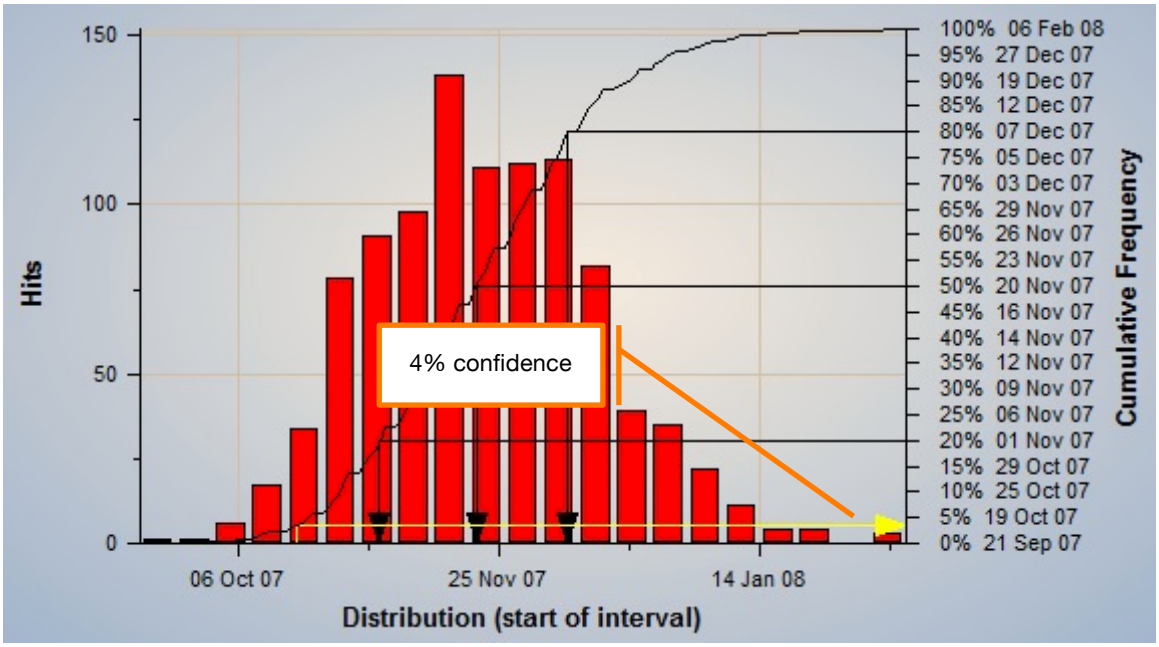


Figure 1 – Low Schedule Confidence Level

Figure 1 shows risk results for an example project with a very tight risk range applied to it (-10/+20%) with a resultant confidence level of 4%. This low confidence level is largely driven by the high number of parallel paths in the schedule and not the risk inputs.

Risk Contingency

Risk Contingency is also a commonly used metric to determine risk exposure. Contingency is always represented within the context of a given confidence level. The amount of required contingency needed on a project at say a very aggressive 20% confidence is going to be less than the required contingency on the same project at a much less risky P80 level. Risk-appetite for the project drives the confidence level against which contingency is reported.

While contingency is a powerful risk metric, is does little for addressing the root cause of risk but instead acts as a buffer against risk – it is more risk acceptance than risk reduction. Conversely, risk mitigation is a pro-active risk response technique that truly

attempts to reduce risk exposure and thus reducing the amount of additional required contingency.

Joint Confidence Level

JCL is a risk metric that gives a probability of achieving a combined target schedule confidence and target cost confidence. Based on the combination of cost and schedule confidence (described above), it can be used as a target risk level for which a project to achieve. In theory, this is an excellent approach as it ensures we don't focus risk reduction efforts solely in one dimension (cost or schedule) at the expense or neglect of the other. In practice, it is an extremely difficult target to achieve.

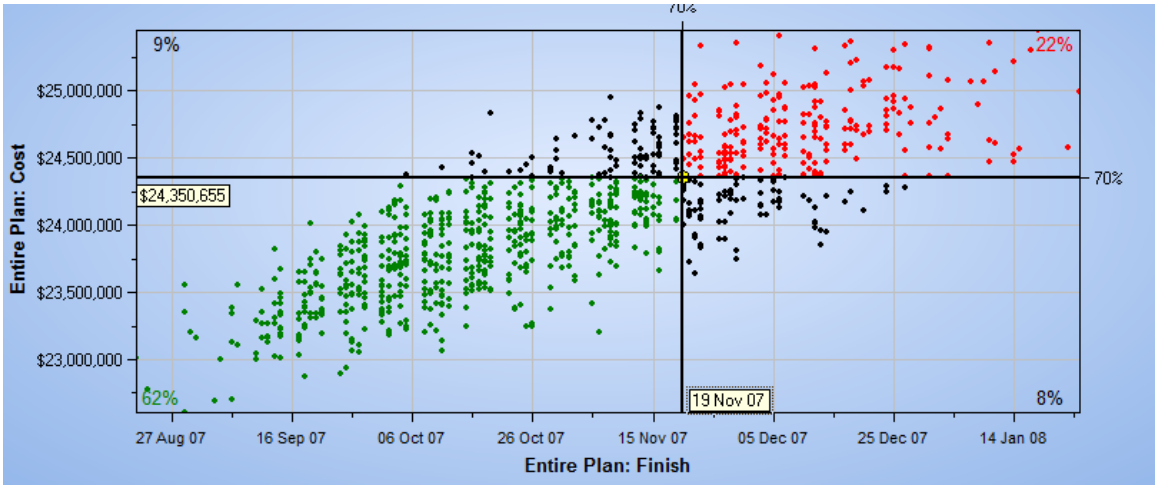


Figure 2 – Reporting JCL

Figure 2 shows an example JCL report in the form of a scatter diagram where the target cost and schedule confidence levels have been set to 70%. As a result, the combined probability of achieving a 70% JCL in this example is 62%. It should be understood that a target JCL of 70% does NOT mean a target schedule confidence level of 70% and a respective target cost confidence level of 70%. Instead, the JCL is calculated by determining the percentage of risk simulation iterations that achieve both a given cost/schedule confidence level. In short: cost/schedule P70 confidence does not equate to a P70 JCL.

Why is a high JCL Target Almost Impossible to Achieve?

As described above, JCL is dependent on two factors: cost and schedule confidence level. As we've already seen, schedule confidence suffers heavily from merge bias and so basing JCL so heavily around schedule confidence level results in very skewed results.

Even if we consider a project with a very high cost confidence (say 90%) with activities that have an equal chance of being early or late, when we calculate the JCL, we are left with a very low percentage JCL. Thus tasking a project with a JCL of say 70% is extremely aggressive and depending on the complexity of the project, close to impossible to truly achieve.

An Alternate Solution: Risk Range Certainty (RRC)

Traditional risk range is defined as the difference between the best and worse case scenarios from a risk analysis (otherwise known as the difference between the P100 and P0 results). Risk range is an extremely valuable risk metric as it gives a **true indication** to the degree of risk exposure.

Taking this a step further, if we represent the range as a percentage of the remaining work left in the project, we give **context** against the remaining scope of work. A three-month risk range represents a very different risk exposure on a six-month project to that of the same range on say a ten year project. Representing range as a percentage, therefore, overcomes this.

To introduce Risk Range Certainty (RRC), consider the example two-year project in figure 3 whose schedule risk range is calculated as 138 days. 138 days on a remaining two years worth of work equates to 19% risk range on the remaining duration – that is to say, the remaining duration on the project may vary by up to 19%. With 19% range uncertainty, we may also view this as having 81% **schedule risk range certainty** (RRC). With only a 19% range of risk, reporting this as 81% schedule certainty gives a truer indication of the risk exposure for schedule. What is more useful? Reporting 4% confidence or having insight into the fact that we have 81% range certainty in our project.

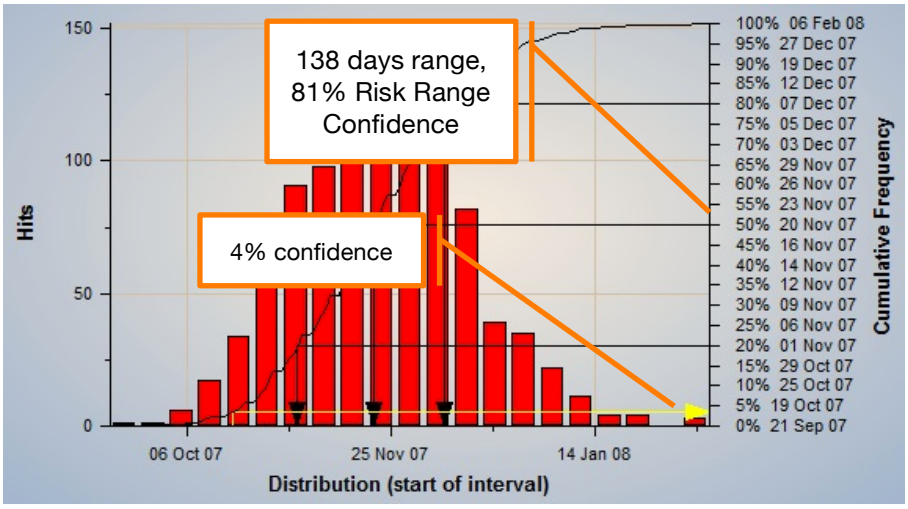


Figure 3 – Risk Range Certainty (RRC) Reporting

Conclusion

Reporting risk exposure through the likes of confidence levels and statistical analysis can be challenging especially to a project audience that is focused on finite and deterministic goals. Add to this the fact that schedule confidence is driven not only by risk but more significantly by the structure of the schedule (parallel paths) and the task of successful risk reporting quickly becomes a major problem.

Understanding both cost and schedule risk exposure is without doubt a necessity but tying these together through the product of these percentages is highly questionable as explained above.

These issues can be largely overcome by reporting risk in a manner that gives true meaning and context. As a result, the Risk Range Certainty (RRC) factor is experiencing a highly favorable response within project teams and executives alike.

Additional Information

Acumen specializes in project analytics and is the author of Acumen Fuse™, a project assessment tool. More information on project assessment through metric analysis, risk assessment and Fuse™ can be found at www.projectacumen.com or by calling +1 512 291 6261.