

# To quant or not to quant?

by Dr David Hillson, director, Risk Doctor & Partners

Quantitative risk analysis is hated by many but loved by some. There are people who say that you can't understand the risk exposure of a project properly without using a quantitative model that simulates the combined effect of risks on overall project outcomes. Others say that quantitative risk analysis is too hard, gives misleading results, and is subject to the GIGO effect (garbage in, garbage out). Are there any clear guidelines on when quantitative risk analysis is appropriate for a project?

First we should clarify what we mean by 'quantitative risk analysis'. Strictly speaking, this term can be used for any analytical method that uses numbers to estimate the effect of risk on objectives.

For most people, quantitative risk analysis means Monte Carlo simulation, but it also encompasses other techniques such as: decision trees, influence diagrams, sensitivity analysis, system dynamics, analytical hierarchy process (AHP), fault tree analysis, failure modes and effects analysis (FMEA), multiple estimate regression analysis (MERA), method of moments, and others. This article focuses on Monte Carlo, but many of the points apply equally to the other quantitative techniques.

So, when should we use quantitative risk analysis techniques? This type of analysis is not suitable for all projects. Performing a quantitative risk analysis requires additional time and effort that may not be available. Specialist skills may be needed to construct and run risk models, and to interpret the results, and if these skills are not present in house then they may have to be bought in from expensive consultants. Quantitative risk analysis requires use of specialist software tools, which impose additional costs for purchase, training and maintenance, and which may not interface seamlessly with the existing project management toolset. Quantitative results may not be easy to interpret, and can even be manipulated to give the 'right result' by unscrupulous users who may want to support a preferred outcome (for example, to bid or not to bid, or to cancel a project or keep it going).

For these reasons, people often shy away from using quantitative risk analysis. These techniques are then reserved only for projects that are large, complex, strategically important, mission-

critical, sensitive or innovative. Each of these characteristics translates to 'high risk', when a more robust analysis of risk might be justified. However, each of the criteria listed above is also subjective and situational. How do you decide if your project is 'large' or 'complex'? Each organisation needs to decide what these terms mean for its business – consequently different organisations will use quantitative risk analysis in different circumstances.

So if you've decided that your project is suitable for quantitative risk analysis, and that you're going to use Monte Carlo simulation, what do you need to do? There are some prerequisites for a successful analysis, without which you are likely to miss the main benefits. These include the following:

- A good baseline model representing your best plan for the project. This might be the project's schedule if you're conducting an analysis of schedule risk, or the cost estimate for a cost risk analysis. For an integrated cost-time risk analysis, a fully costed and resourced schedule is required. If these are very detailed, it may be necessary to produce a summary schedule or estimate to act as a basis for the analysis.
- A full set of identified risks which have been assessed for probability and impacts, and which are well understood, including both threats and opportunities. These risks should be clearly documented in the project Risk Register, and they will form the basis for the data in the risk model. It is also important to understand any links between risks, including common causes or dependencies, as these will need to be modelled.
- Commitment to high-quality and unbiased data, honestly reflecting the effect of risk on project tasks. It can often be difficult to obtain good risk data, since people wish to present their work in the best light and may be reluctant to admit to any uncertainty. Project stakeholders may need help from a skilled facilitator to expose their biases and generate realistic risk data.
- Appropriate software tools to perform the analysis, with a good user interface, all the required technical functionality, and the ability to

integrate with other project management tools. People who can use these tools are also required, able to enter data, generate reports, and interpret outputs.

Assuming that you've covered these prerequisites, what can you expect quantitative risk analysis to deliver? Why bother? These techniques can produce a range of benefits for projects that use them properly, including:

- predicting the combined effect of identified risks on overall project outcomes
- revealing key risk drivers with the greatest overall influence on the project
- assessing overall project risk exposure
- testing the likelihood of meeting key project objectives
- demonstrating the expected effect of planned risk responses
- supporting what-if scenario analysis to explore options
- allowing determination of appropriate contingency levels.

Quantitative risk analysis should not be avoided or seen as too difficult. It is a powerful technique that offers unique insights into risk exposure. In the right circumstances and used properly, it forms a vital part of the risk tool kit, allowing the project team to focus on the main risks, and supporting development of effective risk responses.

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David is an active member of the global Project Management Institute (PMI) and received the PMI Distinguished Contribution Award for his work in developing risk management over many years. He is also a Fellow of the UK Association for Project Management (APM) and a Fellow of the UK Institute of Risk Management (IRM).

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