



## @RISK Professional

How might your project risks affect your budget and schedule? What effect on these might your mitigations have? **Steve Cotterell** looks at an application built to help you understand the options.

All projects involve risks, but it's vital to understand what those risks are and how they might affect your budget and schedule. @RISK is a well-established software tool that's been designed to help you do that.

Businesses face a great deal of uncertainty and this is probably more true in the project management arena than any other. There are many ways of handling risk management, most of which aim at producing set dates and budgets on which decisions can be made.

Palisade markets a suite of decision tools but their flagship product is @RISK, a software tool that enables you to look at ranges of risk options and likelihoods, thus enabling mitigations and more informed decisions to be made. The company also offers training and consultancy to help people understand how the software and methodologies can be best applied.

Palisade was founded in 1984. The founder still owns the company and the lead developers have been with him for thirty years, allowing the organisation to claim much experience and insight in the risk management area. The company headquarters are in New York and there are offices in Sydney and Rio. The EMEA and Indian business is handled from the UK offices and the company has an extensive partner network.

The company tells me that it works closely with its customers to develop solutions and that because the software and methodology are versatile, they can be used in many areas other than project management. I'm told that @RISK is used by 74% of Fortune 500 companies and more than 90% of FTSE 100 companies.

In 1988 the Harvard Business School started introducing their students to @RISK and this continues today. According to Palisade, the majority of their customers first heard about @RISK at university or business school, and more than 40,000 students per year learn about the software in this way.

The purpose of @RISK is to allow probabilistic analysis

to try to understand business and project uncertainties. It does this by providing Monte Carlo simulations for Microsoft Excel and Project plans.

Costs, task durations, etc. are all subject to uncertainty. Using the Monte Carlo method of simulation, multiple options to a given situation are captured by the generation of many hundreds of thousands of scenarios. These are then analysed to assess the levels of likelihood of every instance and from this you can work out your level of confidence in any set of outcomes.

On opening @RISK, you are presented with a blank Excel workbook with some additional functions added to the toolbar ribbon.

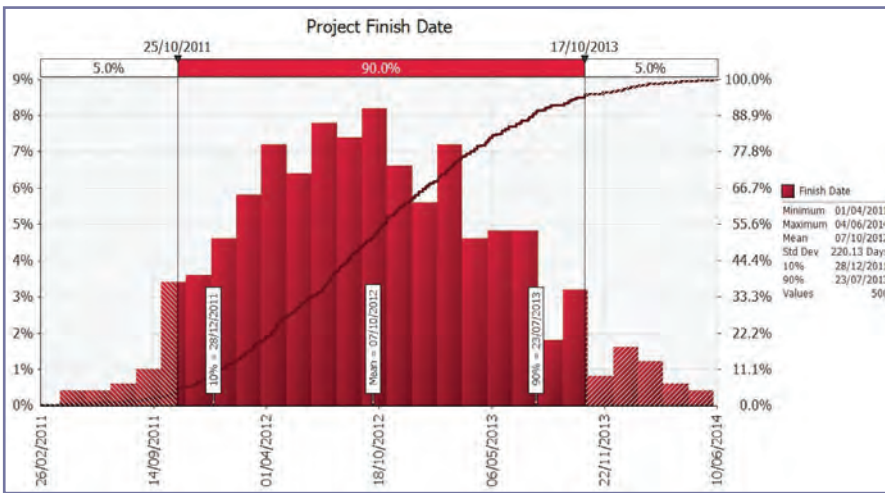
Taking a cost estimate example, you would firstly enter the details of the cost estimate onto columns on the spreadsheet, under appropriate cost headings. You would then consider the levels of uncertainty in each of the cost items entered, as a range between the lowest possible cost and the highest. You would also enter what you considered the most likely cost to be, giving you a three-point estimate for each cost, the lowest, the highest and the most likely, based on your knowledge and experience.

When considering task durations, you would similarly create a table showing your estimations of the shortest, the longest and the most likely durations.

Clicking the ribbon's "Define Distribution" button, you select, from the examples offered in the window that opens, the distribution curve that you would apply to each uncertain variable in your table

There are two types of distribution curve. The first, "Continuous", is used where any value between the

**A Monte Carlo analysis results graph**



examine the pattern of the data against the different distributions held in the system and match the most appropriate to the pattern of the data, as probably being the best one to use for the future work.

Where you have a set of time series data, for example, the price of a commodity going back over a number of years, you can ask @RISK to examine the data pattern and make a series of predictions about the possible trends in the future, picking the most likely to use with your analysis. You must

lowest and the highest in the range that you have defined is possible.

The other, "Discreet", is used where you have a definable number of specific alternative possibilities (e.g. yes or no, or how many).

@RISK displays, below a tab, the most commonly used curves and, in the opinion of Palisade, the ones that most of their project management customers use. These are:

"Continuous, Lognormal" - this range includes no options below zero and appears as a bell curve with a long tail of increasingly less likely outcomes.

"Continuous, Pert" distribution is illustrated as a bell curve with a minimum, a most likely and a maximum.

"Continuous, Triangular" also with a minimum a maximum and a most likely, similar in many ways to the Pert curve.

"Continuous: Uniform" this curve has both minimum and maximum parameters but no most likely figure and so is without bias towards that.

"Discreet: Bernoulli/Binomial" represents a choice between two options.

"Discrete: Poisson" giving a choice between a definite number of event outcomes.

In those instances where you have a set of historical data to use as a reference for future work, you can click 'Risk's "Distribution Fitting" button. Doing this causes @RISK to

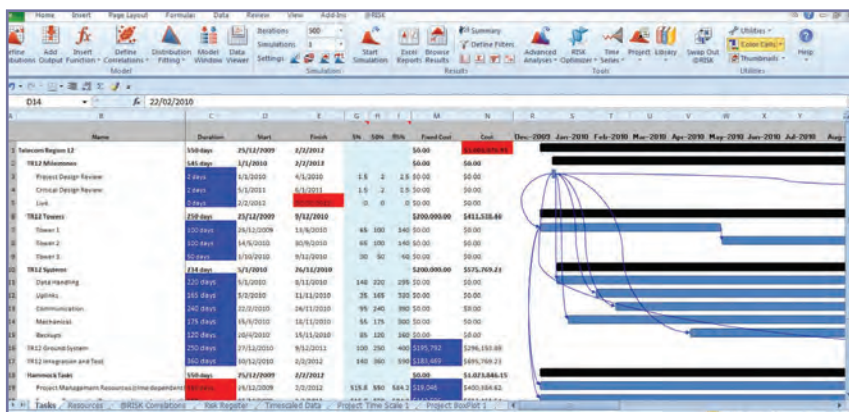
always bear in mind that the past is not necessarily a good indicator of what will happen in the future, but this is a matter for your consideration in your risk register.

When setting a distribution's parameters, sometimes minimum and maximum figures are not appropriate. You can then set alternative parameters based on percentages so that you can say, for example, that 95% of the time the lowest figure will be x and 90% of the time the highest figure will be y. This allows the curve to overlap the two parameters when performing scenario analysis.

An @RISK library gives organisations the ability to set up a shared database of distributions and models which can be updated to take account of changing circumstances.

Having assigned a distribution curve to each uncertainty in the list, you create a cell to total the value of all of the curves in the list and in the simulation process. You can specify how many iterations (scenarios) are to be run. The software then calculates the specified number of cost variations for each of the items in the list and produces a curve showing the likelihood of the total cost falling at each level. From this curve you can see the likelihood of the total cost being any specific amount within the range.

You can set two points on the curve and have the system calculate the percentage probability that the cost will fall between those two points. You can also set a point on the curve and see the percentage likelihood that the cost will be below that amount.

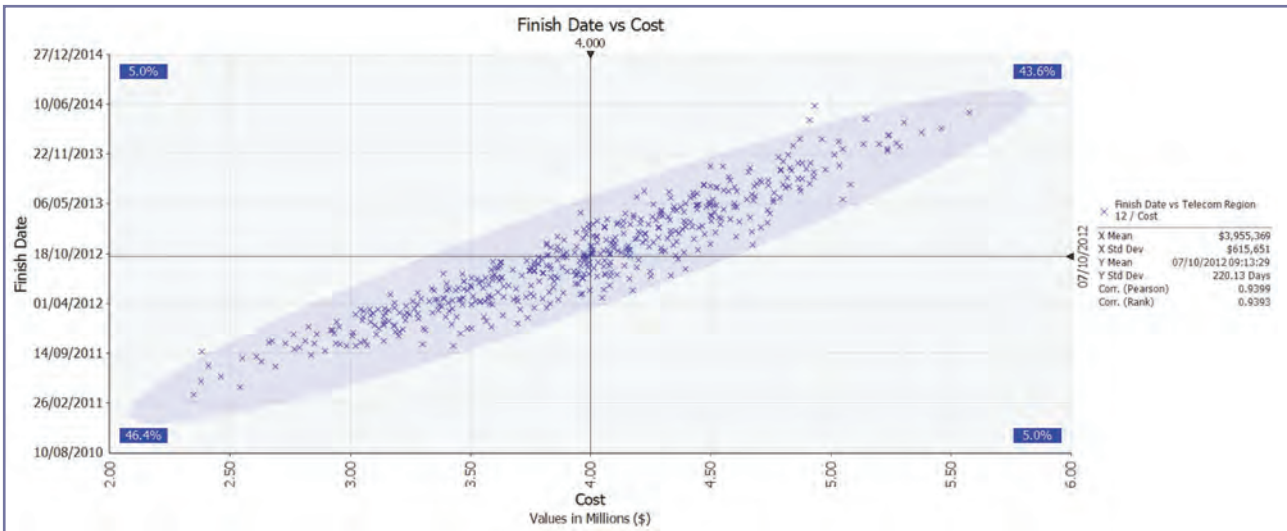


At this point you can conduct sensitivity analysis. A "Tornado Bar" graph can be displayed and this shows the variation experienced for each uncertainty analysed and therefore shows which uncertainties have the greatest effect on the variation in the final cost.

A correlation between two or more uncertainties can be set up so that the level of one item has a direct effect upon the others. To do this, you open

**The MS Project Gantt chart imported into Excel**

## A cost v. time scatter chart



a specific dialogue box and, using a slider, enter your estimate of how the level of the first variable affects the level of the other(s).

Having completed your sensitivity analysis, you are then in a position to perform stress analysis. Returning to the Tornado Chart showing you which areas of your plan are the most critical, you select the most sensitive areas of the plan and run another set of scenarios where extremes of highs and lows are applied to show what would happen to the plan if things were to start going wrong in these areas. This gives you the opportunity to acknowledge the risks involved and take mitigation action.

@RISK has the capability of importing a Microsoft Project schedule and converting it into an Excel spreadsheet. All Project data are imported and displayed on a Gantt chart within Excel.

The constraint links drawn between tasks in the Excel Gantt appear to be drawn in an amateurish and untidy way - which I don't like. Palisade tells me that this effect is produced as a result of the way Excel works and, if you need to see the constraints, this is the only way that they can be shown. Fortunately, they can be hidden.

Three additional columns are added to the Gantt chart's spreadsheet to contain the minimum, maximum and most likely durations for each task. For each task where there is uncertainty, you can specify a distribution and then run the Monte Carlo simulation. As each task duration is calculated in Excel, this information is passed back to Project which then calculates the project total duration using these figures. Project then passes that figure back to @RISK which uses it as data for its final calculations.

As well as considering uncertainty, you also need to consider risk. Returning to the Excel table, against each task you add details of each risk that you identify and enter the percentage likelihood of that risk happening, the likely cost if it does occur and a probability distribution to apply for the likelihood of each risk happening.

If you then rerun the Monte Carlo simulation, the risk and likelihoods are also taken into account and the final figure

can look rather different. Once you have these figures available, the system can calculate the level of contingency required to be certain of completing the project at any given figure so, for example, to be 95% sure of finishing within budget you will need a larger budget than for a 75% level of certainty.

The system incorporates a set of reports so that all of the figures and graphs used can be produced in report format and @RISK is able to display, as a scatter chart, the correlation between the project schedule and the project cost. All of the reports and graphs included with @RISK are customisable. The graphics are all produced within the @RISK application, although they can be exported back to Excel or as PDFs. Graphs can be sent to PowerPoint and can also be copied and pasted into other applications.

For many projects the costs are solely resource-based but, for those projects where there are additional cost uncertainties, it is also possible to include information and distributions for those extra cost uncertainties.

@RISK includes many example Excel forms which can be used as templates and, using one of these, it is possible to set up a project risk register. The risk likelihood and severity data can then be incorporated into this register and this data can be used when @RISK calculates the scenarios. It will show how many days should be added to the schedule, and subsequent increases in costs, when risks are factored in.

When the calculations have been done, a probabilistic Gantt chart can be produced which illustrates the level of uncertainty associated with each task and, using this information, displays the "Critical Index" showing how often each task appears on the critical path and therefore how important it is to the ultimate timely completion of the project.

A risk register that incorporates mitigation information can also be set up. This includes the basic risk likelihood and severity data, which is taken as pre-mitigation data. A further set of columns can be included for mitigation action and the amount to be deducted or a predicted post mitigation



## A Tornado chart

figure. @RISK can then produce project pre and post mitigation data with graphs showing how successful the mitigation efforts would be. Cost benefit analysis can also be carried out to show where the expenditure on mitigation is likely to be most effective.

An Excel developer's kit, which is included in the out-of-the-box system, allows the import of data from third party systems, which can then be used for analysis by @RISK. The kit can also be used to build applications containing standard data input forms and workflows in order to standardise the way that certain tasks are handled within an organisation, and includes a standard set of analytical reports.

To enable new users to understand how to apply the methodology and to use the application, Palisade runs a two-day standard training course covering these topics. There is also a further one day for more advanced users.

As I mentioned at the start of this review, Palisade markets a suite of decision making and risk analysis tools 'The DecisionTools Suite'. Another application worth mentioning here is TopRank, which is part of that suite. This tool allows you to audit Excel models to determine which are the most sensitive areas. TopRank performs forensic analysis on the model to define which areas are the most critical in the way the end results are affected. A Tornado chart is then produced which illustrates those areas, where mitigation action might sensibly be considered.

## How much does it cost?

### Standalone licences (unit cost)

@RISK Standard: £1,000, @RISK Professional: £1,250, DecisionTools Suite Professional: £1,850

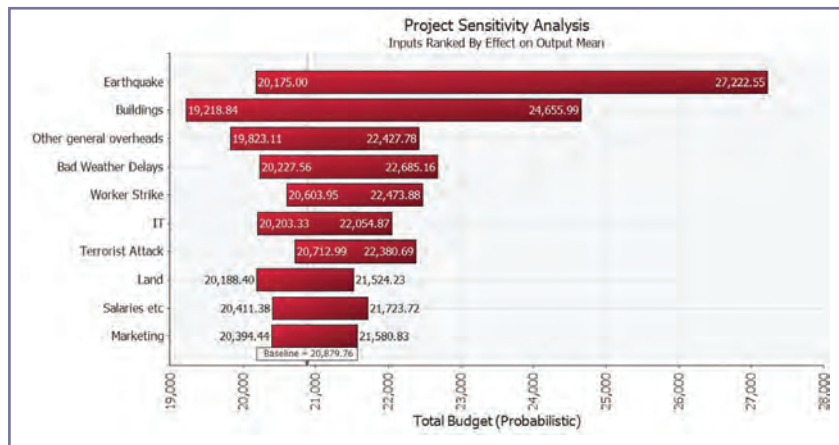
Stand-alone licences can be installed on one machine (desktop or laptop) and used locally on that machine. The Professional version includes the integration with Microsoft Project, along with some additional functionality.

### Network licences (cost per seat)

@RISK Standard: £3,500, @RISK Professional: £4,375, DecisionTools Suite Professional: £6,475

Network licences provide a way of sharing licences among a group of users. Each seat can be occupied by one person at a time, but there's no limitation on the number of people who are entitled to use that seat when vacant.

All prices include one year's free maintenance, technical support and product upgrades. To renew the maintenance from year two onwards costs 20% of the retail price. All prices exclude VAT.



## Right to Reply

This is a useful review of @RISK as it provides hands-on, practical details on how to use the product, while explaining what it does and how.

We would supplement the information with an all-important focus on the human element, as we know from customers that this is a key element of the benefits we deliver to the end-user. Palisade has been successful for over thirty years because it develops sophisticated technology that is easy to learn and intuitive to use.

@RISK is an integral part of a complete risk and decision analysis toolkit (The DecisionTools Suite), with each element working in Excel, so users know how to get started and can very quickly begin running simulations and produce easy-to-interpret results. This allows informed decisions to be made, which saves time and money, for example by determining at the outset whether a project is feasible.

The versatility of Palisade's tools has led them to be used for an extensive number of applications in a wide variety of sectors around the world. Customer case studies illustrating the almost limitless applications of our technology are available on the website: <http://www.palisade.com/cases/>

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