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# Risk management and middleware projects

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## **Management introduction**

*Nick Denning is the Chief Technical Officer of Strategic Thought Group Plc (Wimbledon, UK) which he founded in 1987, having previously worked for Logica. Strategic Thought, since inception, has been involved with 'big software', from Ingres into the middleware market with Tuxedo before WebSphere middleware products and the services around them.*

*In 2001 Strategic Thought launched its first product, called Active Risk Manager. This is now a leading enterprise risk management solution, with customers from backgrounds as diverse as NASA, Lockheed Martin, the UK's Ministry of Defence, London Underground, Thames Water, Nestle and the 2012 Olympic Games.*

*Much is talked about risk management (RM). Many people, however, find it difficult to adopt risk management techniques. In this analysis Nick Denning illustrates — through the use of selected features of an enterprise risk management solution — the significant benefits for managing projects that can be obtained quickly and with minimum training. In particular he relates this to middleware projects.*

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## What is risk?

What is risk? It is uncertainty. The underlying premise of Risk Management (RM) is that all endeavors and investments serve to increase share/stake holder value, but all investments and endeavours face degrees of uncertainty:

- are the requirements unambiguous?
- will the hardware be delivered on time?
- have the suppliers been late before?
- are the team members properly trained?
- are there any flaws in the design?
- will the customer sign off promptly, as defined in the contract?
- is an SLA in place?
- will the SLA guarantee delivery?

Most will be able to identify many more known issues which must be resolved as risks and which will have to be addressed in any attempted endeavor. The issue is how account for this risk? The 'old school' approach is to slap on a healthy contingency as a percentage of the total cost and time for the project. However, how many projects (with what seems an appropriate amount of contingency) are still late and over budget? The 'new school' approach is risk management. In this analysis I take an example project and show how one can:

- structure a project plan in such a way that the approach reflects good practice to minimize risks inherent in a middleware project
- apply three point estimation to a good project plan and then apply schedule analysis to determine the likely outcome
- identify opportunities and risks that would impact the plan, either positively or negatively, and describe how to deal with these.

The benefits of following the approach described are that:

- organizations obtain a more finely grained and accurate mechanism for calculating contingency
- the tasks and their associated costs, time and resources required to address risks are built into the plan from the start so the plan is more accurate and realistic
- a knowledge of risks is shared, and specific responsibilities for addressing risks are clear and defined in the project initiation phase.

In the following sections I illustrate aspects of this approach as applied to a middleware project. (If further detail is required the author offers to provide this.)

## Applying risk management techniques to a middleware project

In the August 2007 **MIDDLEWARESPECTRA**, I identified a range of risks that apply to middleware projects. That analysis was able to identify that many of those risks related to people risks. Indeed I identified seven key risks — and all of these related to people factors.

Using modern risk management techniques it is possible to provide a considerably enhanced degree of precision around this process. This comes, however, with a price:

- the process has to be defined
- people have to be trained
- there is a cost of carrying out this process to generate the risk information
- organizational change must be managed to exploit the risk management information generated.

The objective of this analysis is to demonstrate the application of simple risk management techniques to smaller projects — what might be called 'light touch' risk management — in order to obtain a clear benefit from the implementation of a simple process.

## Is that effort worth it?

The IT industry has seen initiatives come and go, with associated specialist practitioners 'gold plating' their discipline to generate deliverables that are ends in themselves rather than supporting objectives that deliver an organization's goals. Is enterprise risk management a similar 'fad' that will pass soon? I believe not. This is because, inherently, risk management is something that we all do on a daily basis in almost every aspect of our lives. The issue is, therefore, not whether or not an organization will practice risk management, but rather whether or not an organization will incorporate RM into its business processes using a software solution because a return on investment (RoI) can be identified.

Experience on very large programs shows that risk management provides a substantial benefit. It can be difficult to measure the benefits of RM at a micro level — how do you measure the cost of something that has not happened? However organizations that have adopted RM into their processes observe that they have avoided major project failures. Teams of 'specialist risk practitioners' who are responsible for the successes in avoiding failure have developed increasingly complex risk processes. Based on the lessons learned, organizations are currently implementing risk simplification processes. It is necessary to remove the

'gold plate' and focus on 'simple processes, quickly executed' that use accurate data and deliver well managed risks.

Recent legislation is increasing the personal liabilities of directors. Companies must now report on the risks that their organizations face and are called to account if those risks have not been properly managed. Thus executives have an incentive to introduce risk management systems to ensure that their organizations can identify, assess and manage their risks learning from experience and developing the overall capability for risk management within an organization. Indeed, the greatest obstacle to the introduction of an RM solution is not cost but:

- **managing organizational change**
- **training staff**
- **motivating people to undertake risk management**

because each person involved must see the benefit that arises.

Implementing organizational change is difficult as those that have implemented BS5750, ISO9001, AQAP 13, CMM and others will attest. We generally advocate a combined top down (corporate-led) and a bottom up (project, practitioner or evangelist-led) approach to capture accurate data

with which to ensure that all staff involved in managing risks. We have identified that, as the capability of such experts increases, then risk management becomes more accomplished.

### An example

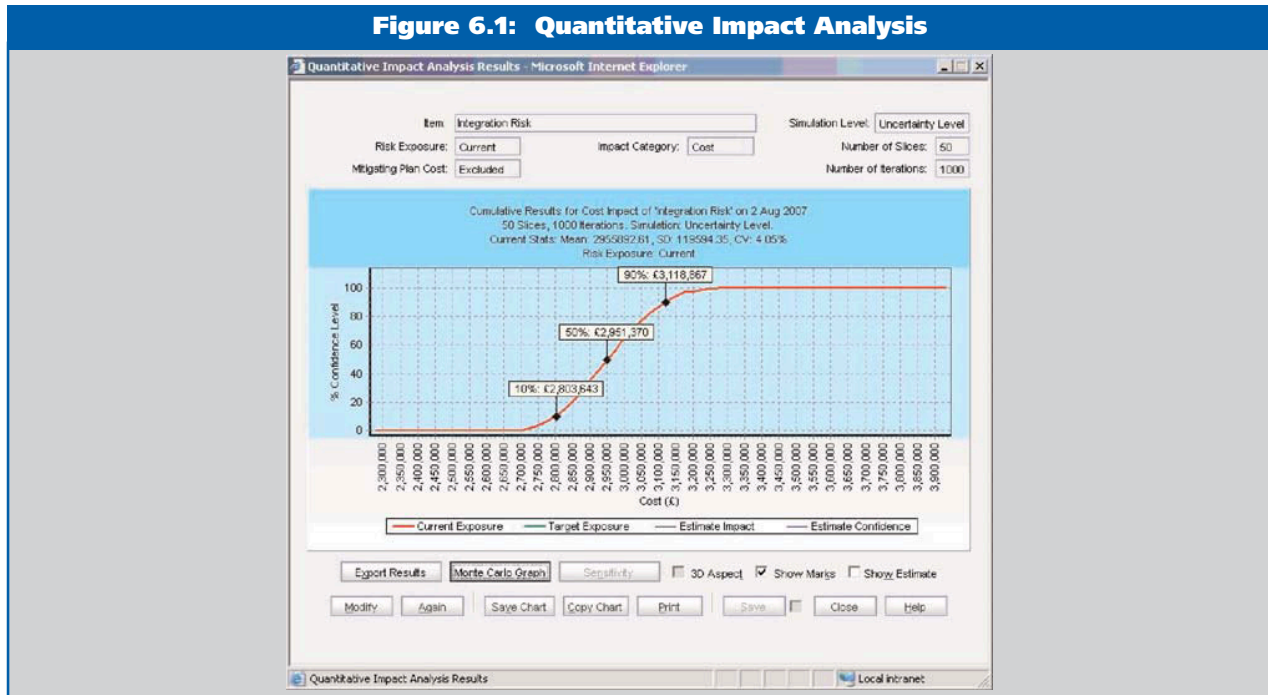
To attempt to understand this, I am going to use an example middleware project and apply some straightforward risk management techniques to it. To set the scene in perspective, and to illustrate the benefits obtainable, understand that the work described represents about 3 man days of effort. This includes:

- **the construction of a project plan**
- **the allocation of people**
- **the assessment of a single risk and a single opportunity.**

Remember, in this context, that the objective is to try to avoid treating risk management as a science — which is expected to deliver right/wrong and go/no-go answers — but rather as a process aid. For instance it is not essential to capture every risk that might be relevant to a project. Rather the imperative is to focus on the major risks.

The simple process that might be followed goes as follows:

**Figure 6.1: Quantitative Impact Analysis**



- identify the requirements to deliver against
- identify the tasks that need to be completed to deliver those requirements (rather than following the normal practice of just adding 10% contingency at the end to every task)
- assess every task and say what is the shortest time in which it is possible to complete, the most likely time and the longest time — and then apply the same to the associated costs.

Many project plans are simple task lists which might be equally well set up in Excel. In practice there is limited project management going on in them. It is, however, necessary to continue to build a plan by identifying the dependencies between tasks. Providing one can link the tasks, one can schedule analysis in a risk management tool.

Microsoft Project (MSP) is quite flexible. Having created a first cut project plan in MSP and defined the expected cost and duration for each task I can now do three point estimation to assess the best case, most likely and worst case outcome for each task. From a Gantt chart one can select (say) Add Columns and include the columns Cost1, Cost2 and Cost3 together with Duration1, Duration2 and Duration 3. It is then possible to have the locations hold three point estimates; now copy the initial cost and duration values into Cost2 and Duration2 and assess each task

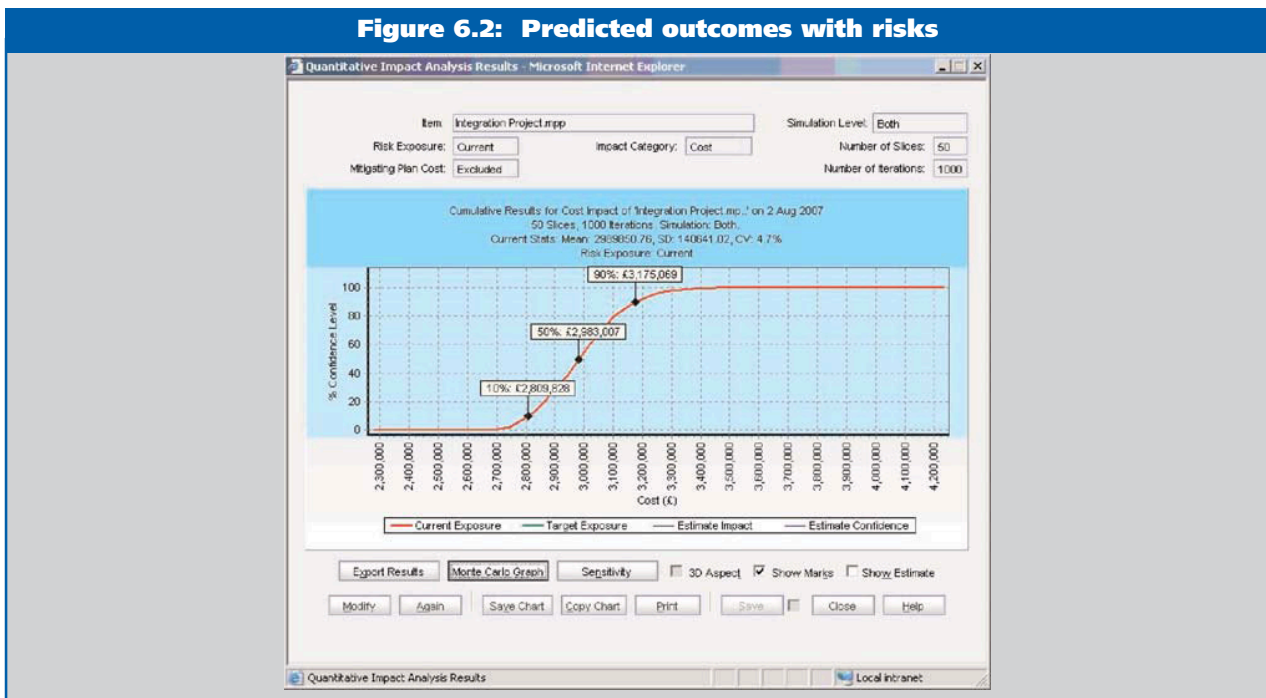
and enter the best and worst cases for cost into Cost1 and Cost3 respectively. Then repeat this for duration.

With this, I can start to load the project into a risk management tool and analyze the project directly for the most likely predicted outcome in terms of date and cost, using Monte Carlo simulation techniques. This will walk through all the possible routes through the tasks using the three point estimation and a probability distribution to determine a range of probable outcomes for the project. In contrast to 'simply' just adding up all the worst case numbers and coming up with a huge project cost and length (which tends to produce a result that assumes that it is very unlikely that everything is going to go wrong), this will produce a more sensible result.

Now it is time to run quantitative analysis tools on the system to look at likely cost outcomes and schedule outcomes. There are currently no risks in the system so the project will be analyzed based on the uncertainties defined for the project tasks. The project estimate (Figure 6.1) was approximately £2.80M based on the summary totals of the tasks. This analysis tells us that there is:

- a 90% chance of bringing this project in at £3.12M
- a 50% chance of delivering at £2.95M
- a 10% chance of delivering at £2.80M.

Figure 6.2: Predicted outcomes with risks



Now I can perform additional calculations for separate segments of the project, selecting a particular part of the work and breaking down the structure to be analyzed. Using the built-in math, this gives an estimate that has (this far) taken just a few minutes to create. Most people do not even need training to reach this far, though most need a little guidance from a risk consultant in the organization.

## Adding risk and mitigation

At this point I can start to add risks. To keep it simple, a pretty straightforward risk has been selected. In the project there is a particular point where the design has been confirmed and it is time to order hardware. The assumption is that a 20 day lead time is sufficient and this has been incorporated in the project plan by putting a 20 day lag between tasks.

But what happens if the equipment cannot arrive within 20 days from when the order was placed? In putting in the cost some assumptions have been made about the cost and delay to the project and team — who are all fired up and ready to go but suddenly without the systems environment on which to work. A team of eight people doing nothing for two unexpected weeks incur a significant cost.

To analyze this, first the risk is entered. Next the risk is scored to quantify the cost and likelihood of the risk occur-

ring after which I can consider any mitigation activities which, if carried out, would reduce the likelihood of the risk occurring and the cost/time impact if it did occur. There might be a number of things that can be done — these do not necessarily have to cost money. Nevertheless it is necessary to record these in order to plan ahead.

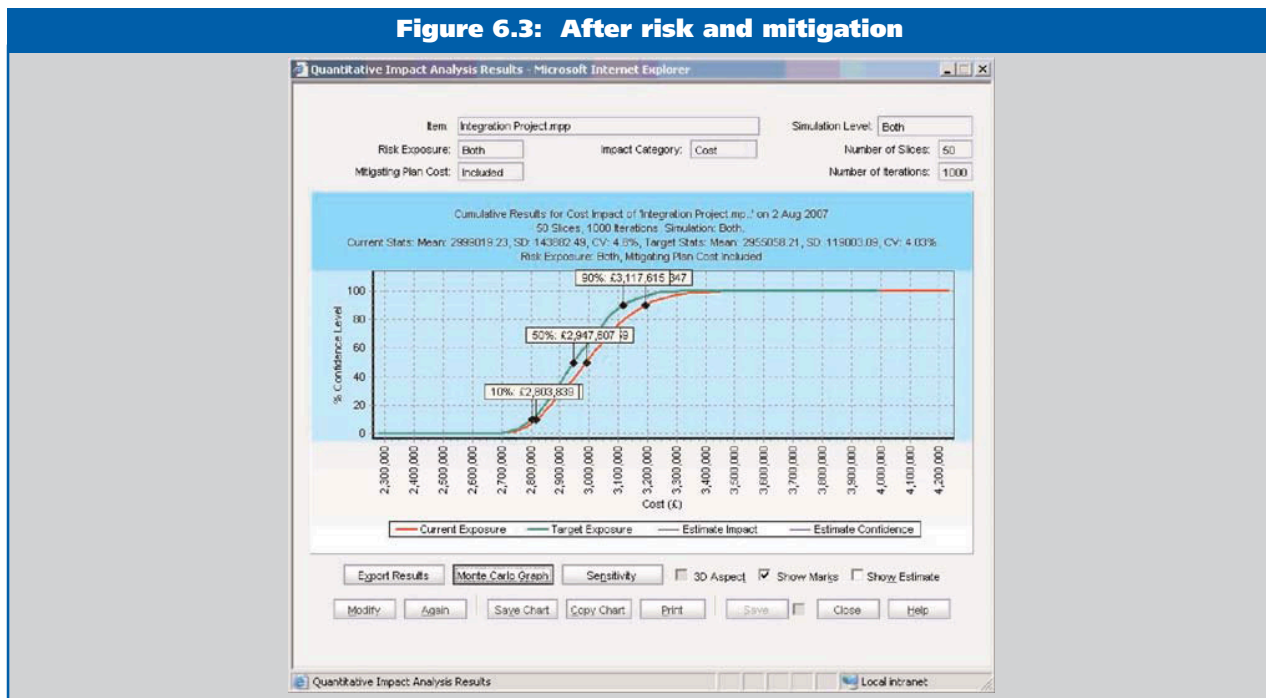
## Risk assessment

Having entered this risk into the system one can now reassess the project. Figure 6.2 provides an assessment of the exposure to the specific risk showing that the predicted outcome at the 10%, 50% and 90% probabilities rise to £2.80M, £2.98M and £3.18M respectively.

The need now is to investigate the likely outcome if I invest in mitigation activities in order to try to reduce the risk to the target level. This can be shown on the green line in the S-curve below (Figure 6.3) — giving a reduction in the expected outcome cost of 10%, 50% and 90% to the £2.8M, £2.95M and £3.12M — and suggesting that it is worthwhile to carry out the mitigation tasks. (Typically one would analyze many more risks and would expect a greater potential benefit having analyzed all the risks in this way.)

So far, so good. The risk process has been addressed and assessed. Ways to mitigate it have been introduced and costed. The analysis has determined that it makes sense to carry out the mitigation. Now it is time to:

**Figure 6.3: After risk and mitigation**



- add the new tasks (that enable the mitigation to occur) back into the original plan
- manage down the risk to the green target level.

(It is possible, of course, to identify mitigating actions where the cost is not justified, and the green line is actually further to the right than the red line. These are mitigations that I would probably ignore.)

### Has enough contingency been allowed?

Typically a project manager will agree a percentage of the total project cost and time for contingency. But how accurate is that? In the above analysis task by task I have considered the required contingency for each task. Due to the detailed analysis exposed to all, there should be much greater confidence in the initial plan and the associated costs and time predicted in Figure 6.1 using schedule analysis.

I then analyzed the risks of the project and identified the mitigating activities and their costs before including in the plan the tasks attributable to the mitigation activities. I also made provision for the resource that will be required to carry out those mitigations. The result is that integrity of this planning process is a major improvement over simply adding 10% to the time and budget.

### Opportunity investigation

Risk is usually considered threatening. This is not the whole story, however. One should also use risk management tools to investigate opportunities.

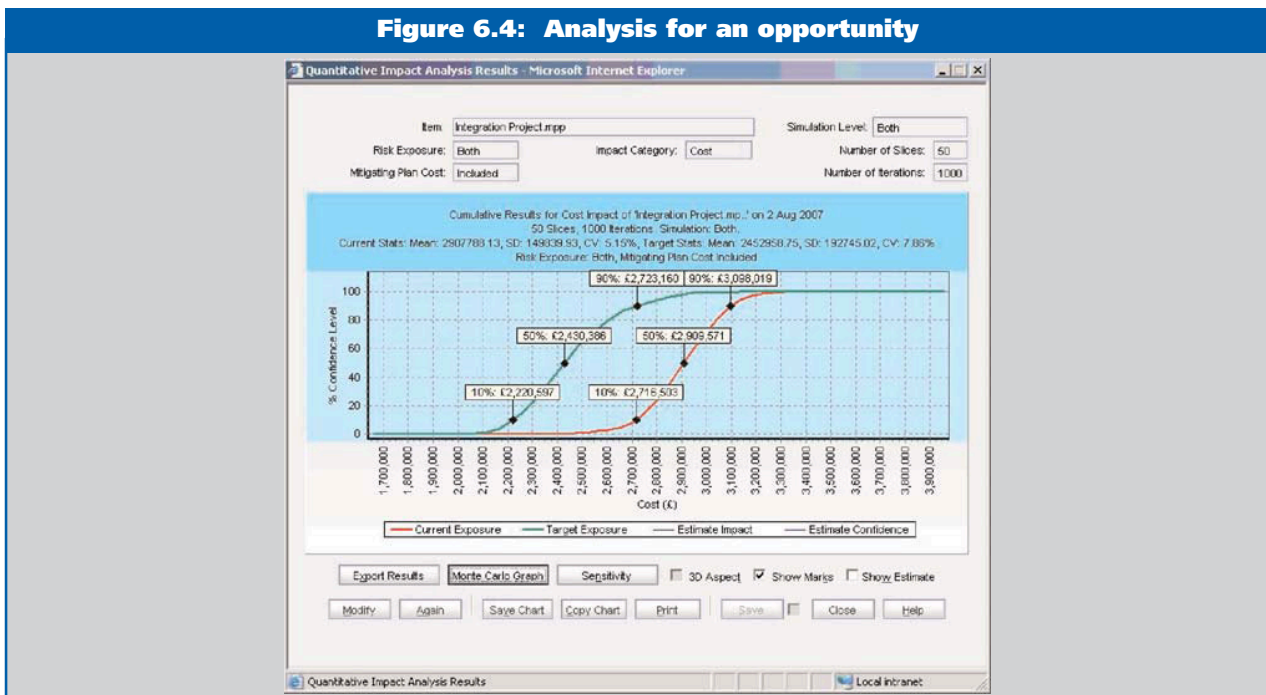
For instance, when building middleware solutions, a project typically uses many environments for development, test, UAT and so on. These can be extremely expensive to construct. I will now consider the opportunity to exploit virtualization, using products like those from VMware.

Such an approach can reduce the cost of the hardware and software required. It may also be able to deliver a more effective Business Continuity/Disaster Recovery solution.

Let me assume, however, there is some organizational skepticism (that perhaps VMware’s technology is not to be trusted). I will, therefore, build into the plan a model which considers the opportunity for savings, including the cost of investing to demonstrate that VMware is a viable technological option — and following the same processes as those described earlier. This results in an S-curve (Figure 6.4).

Impact analysis shows the current (red) and target (green) expected outcomes — and includes the cost of mitigation — demonstrating a significant improvement. Thus the investment in virtualization software and the costs of

Figure 6.4: Analysis for an opportunity



demonstrating to the design authority that it is appropriate are justified by the savings to the projects that will be achieved.

Despite the organizational skepticism surrounding virtualization, it should be possible to build a business case, using this analysis, to explain that there is a 90% chance of saving £350K and a 50% chance of saving £580K on the overall project. It then depends on good project management to ensure that the tasks on the project plan are followed through.

### Key middleware project risks

In the introduction above I referred to the key risks relating to middleware projects. Time and space prevent me setting up and analyzing each risk. Instead I will now select one of those risks and see what further benefits can be obtained from risk management when managing those risks.

Organizations can build up a knowledgebase of generic risks related to their industry and specific risks that apply to their organization, and ensure that risk managers consider whether or not the risks apply to their project. It is important to maintain the confidence of the business sponsor that the project is progressing under good management. By producing project plans and risk plans and then delivering progress in accordance with the plan that should maintain this confidence.

Indeed, even if a risk does impact the project, having demonstrated that the risk was identified, assessed, that mitigation action was taken and that contingency plans have been prepared, the project sponsor should be confident that the team can deal with the issue.

### Management

With the risk assessment complete the priority is to manage the project through its lifetime to ensure that all the mitigation plans are carried out as planned. In effect the need is to manage risks down.

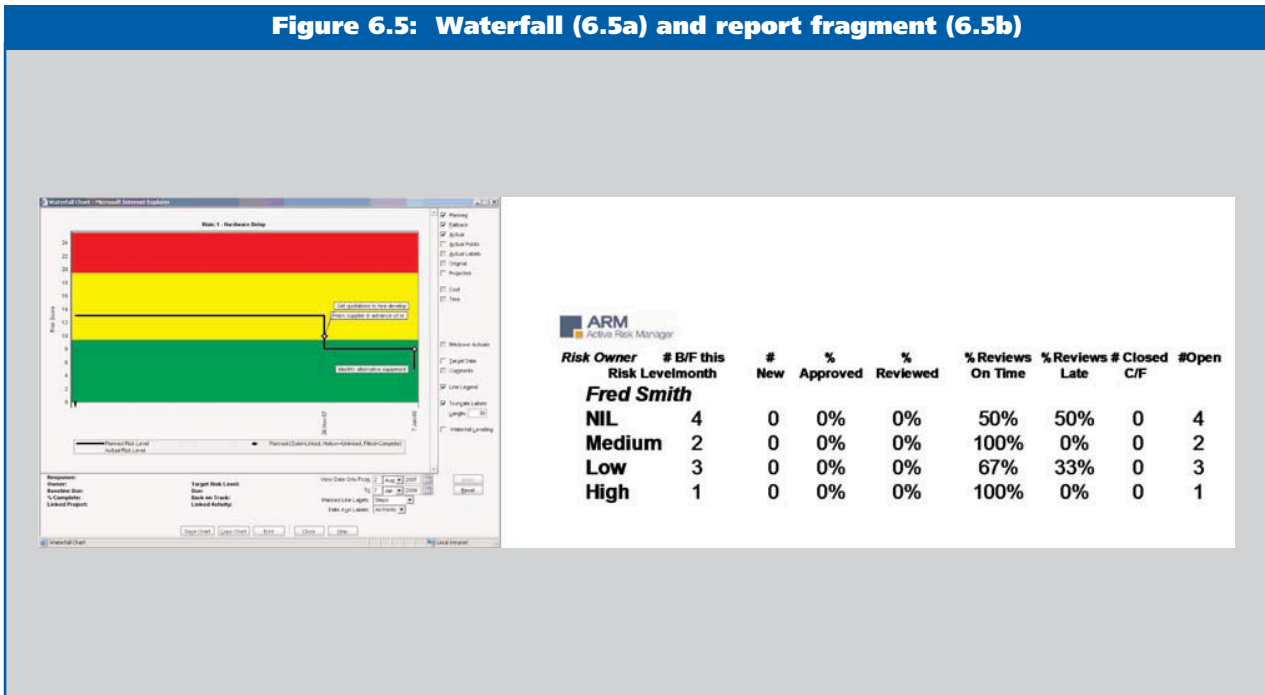
Figure 6.5a shows a waterfall chart which shows when the mitigations entered above need to be completed. To manage the project all I need to do is return to the risk management tool and update the risks as each of the project stages are encountered and completed. All of these changes are then audited as historical data. They provide the basis for the reports.

How does the project sponsor know that risk management is being undertaken? The following fragment from a report (Figure 6.5b) shows whether each person is completing the relevant risk actions by the due date.

### Management conclusion

*The key conclusion to be drawn from Mr Denning's analy-*

**Figure 6.5: Waterfall (6.5a) and report fragment (6.5b)**



sis is that one can take a typical project plan (even one prepared in Microsoft Project) and create three point estimates for each task to model contingencies on a task by task basis. Using industry standard risk management software, within a few key strokes one can obtain a good idea of the likely outcome for any project based on the best assessment of the tasks that were identified.

Using a knowledge base of risks, one can consider which tasks might be affected by those risks. From this one can assess the likelihood and cost of each risk and predict the overall impact on a given project. The same can occur for opportunities to reduce the cost of the project.

With this information organizations can then determine whether there is a return on investment that justifies undertaking additional tasks in order to mitigate risk further. This enables management to answer the perennial question of how much contingency should be allowed. When there are a number of projects competing for scarce

resources and limited budgets this approach offers a clear view of the likely cost that must be set aside for each business activity and enables the selection — or discarding — of projects for implementation. The decisions will be based on a risk adjusted return on investment calculation, one that has been carefully assessed.

In addition there is an ongoing reporting framework — to check that everyone carries out their designated tasks so that risk is progressively reduced. Rather than have to wait until key milestones, organizations can have confidence that the project management approach is effective and they can obtain early warning when projects go off track and why.

This is remarkably simple. Almost every operation given in this simple example demonstrates how straightforward this can be. As so often in system, and just as applicable to risk as in other areas, the best management practice conforms to the KISS principle — keep it simple, stupid.