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Chapter 13

Techniques for Managing Project Risk

Guy M. Merritt and Preston G. Smith

Biographical Sketch . . .

Guy M. Merritt, has extensive experience in leading project management efforts with product development teams. His pragmatic approach to project management consistently receives high praise from various industry sources and he is a much sought after conference speaker on topics ranging from developing R&D productivity measures, aligning metrics to company strategy and risk management. Guy has a B.S. degree from Herzing College and he is the coauthor of *Proactive Risk Management*.

Preston G. Smith, as a principal with the consultancy New Product Dynamics, has pioneered in helping dozens of companies in 20 countries to develop new products faster and more effectively. A major part of his work has been in identifying and mitigating the project risks that lead to schedule surprises. Preston is coauthor of *Proactive Risk Management* and several articles on project risk management. Before becoming a consultant in 1986, he served as an engineer and engineering manager for 20 years. He holds an engineering Ph.D. from Stanford University and is a Certified Management Consultant.

In the context of a project, *risk* is defined as the possibility that an undesired outcome—or the absence of a desired outcome—disrupts your project. *Possibility* is an important word in this definition, because risk is always connected with uncertainty. If something is certain to occur, we call it an issue instead of a risk. Issues are just as important as risks, but since they are managed differently, we separate them at the outset.

Consequently, risk management is a set of techniques for controlling the uncertainty in a project. Depending on the type of disruption that concerns you, the uncertainty could be reflected in project expense growth, schedule

slippage, lack of quality in the deliverables, or deliverables that fall short in some other way, such as being too expensive.

Apart from project management, risk management is often associated with the insurance industry. In fact, risk management is sometimes a synonym for insurance. This connection provides some valuable insights about project risk management. For example, project risk management is not free. Just like insurance, you pay for it, but it yields benefits in reducing uncertainty. In general, the higher the ''premiums'' you pay, the greater the ''coverage'' you receive in terms of reducing uncertainty, but there is a point of diminishing returns. The balance between the premiums you are able to pay and the coverage you desire to receive is a matter of judgment, tempered by your tolerance for risk. It is important to discuss this balance openly and arrive at one that is comfortable for your organization.

Risk is inseparable from opportunity, and this is also important to keep in mind constantly. If you manage risk inappropriately, you can drive out the opportunity you seek in your venture. This is very important in projects that depend on innovation, such as product development: a risk-free project is a sure route to a me-too product. Consequently, risk management is not a matter of driving out all risk, but rather one of understanding the risks the project faces and choosing to avoid some of them and turn others in your favor.

As you can see from the insurance viewpoint and from the opportunity viewpoint, project risk management is a constant balancing act.

Principles of Effective Risk Management

Here we cover some general principles of effective project risk management that pervade the chapter. Please keep these in mind as you read on, because they will help you to place emphasis where it is needed. Our experience with project risk management is mostly related to product development projects, so our treatment and our examples may be biased somewhat in this direction. This is actually advantageous, because product innovation is a demanding application of risk management.

When managing the risk in a project, you should look at the project broadly. Usually, an appropriate perspective is that a risk is anything that will keep the project from achieving its business objectives. The tendency is to view it more narrowly from a functional perspective. Then you not only miss the risks that could occur in other functions, but you also miss more subtle ones that could arise between functions. For example, in product development, engineers normally complete most of the project, so it seems natural to let engineering be responsible for risk management. When this happens, the engineers will typically focus only on technical risks, missing market, scope, supplier, resource, and management risks that are actually more likely sources of business failure.

This implies that a cross-functional team must conduct all parts of risk management—especially the risk identification step. Sometimes you should look even beyond the functions that are usually involved in the project. For instance, we once conducted a risk management session for a new product that was the company's first one aimed at the consumer market (they had made only professional tools). This firm was concerned about product liability risks when amateurs used their equipment. Consequently, they included a corporate lawyer in their risk management group.

Another earmark of good project risk management is that it is proactive. That is, you seek to identify the risk and plan how you will deal with it *before* it occurs. Often it is advantageous to plan your responses long before the risk might occur. As you will see when we describe the action-planning step, the actions you can take against a specific risk usually become fewer and more expensive the longer you wait. Unless you are proactive, not only will some preventable risks occur, but others will also be more difficult and expensive to deal with.

Finally, your project risk management should be based on facts. This may seem obvious, but because risk has so many emotional undertones, it is essential in managing a risk on a rational basis to base it as solidly as you can on the facts that support it. Although people may prefer to sweep the risk itself under the carpet, they are more willing to discuss the facts behind it. Also, using the facts makes it easier to quantify the risk's seriousness, which is essential in balancing the risk's potential consequences against the cost of mitigating it.

We use a tool that will help you base your risk on its facts. We call it the standard risk model (this model, as well as the rest of this chapter, is covered in detail in Smith and Merritt).[1] The model appears in Figure 13–1. We will

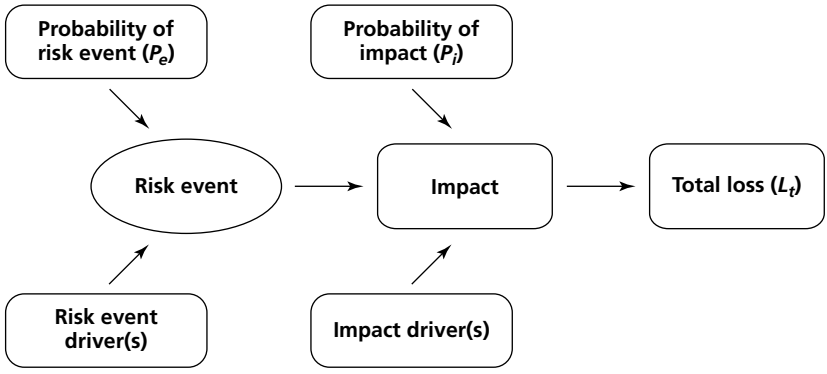

Figure 13–1 The Standard Risk Model. This model helps you to understand the components of a project risk and base it on facts that support it

Source: Adapted from Fastrak Training Inc. training material. Used with permission. © 1996

outline its elements here, and you will see how it is applied as we employ it in a case study that runs through the five risk management steps later.

The starting point of the model is the *risk event*, which is the happening or state that triggers a loss. It leads to the *impact*, which is the consequence or potential loss that might result if the risk event occurs. The *total loss* is closely tied to the impact; it is the magnitude of the actual loss accrued when the risk event occurs. The *drivers,* at the bottom of the figure, are the facts in the project environment that lead one to believe that the risk event or the impact, respectively, could occur. Finally, both the risk event and its impact have probabilities of occurrence associated with them, as shown at the top of the figure.

We will describe the risk management process by using this model, so you will see, as we work through the case study, how the pieces of the model fit together to provide a complete picture of a risk that guides you naturally toward means of mitigating it. The model offers several benefits:

- It separates the risk event from its impact, which clarifies cause and effect and thus helps to focus action plans.
- It encourages quantifying total loss, which is advantageous when prioritizing risks in a project.
- Perhaps most importantly, it facilitates basing the risk on its facts (drivers), which allows the team to discuss it more objectively and reach consensus faster in dealing with it.
- It naturally divides action plans into useful groups, so that action planning becomes more complete and methodical.

Step 1: Identify Risks

We divide the risk management process into five steps, and here we will guide you through these steps by both explaining them and illustrating them with a running example of a risk we managed recently. There is nothing special about these five steps, and indeed, if you consult other authors on this subject or organizations devoted to it, such as the Project Management Institute,[2] the U.S. Department of Defense,[3] or the Software Engineering Institute,[4] you will find a somewhat different process. What matters is that certain vital activities occur, so watch for them and ensure that they are carried out well in your process. In contrast, we believe that our risk model adds a great deal of value to the process, and we know of no other author or organization that does anything similar. Consequently, pay particular attention to how we employ the model.

PREPARATIONS

You should invite a diverse group to participate in this first step, for two reasons. First, you will need a cross-functional perspective in order to uncover the variety of business risks you seek (recall our earlier example about

inviting the corporate lawyer). It will be easy enough to eliminate inappropriate risks later, but you must get them on your list first. Second, this is where the very important phenomenon of ownership begins. Ultimately, in order to obtain action against your most important risks, certain individuals will have to believe in them wholeheartedly and appreciate their nuances. The individuals who will be expected to take action against the risks should therefore be involved now to start building this ownership in the outcome.

Now that you have an eclectic group, you will need a skilled facilitator to lead them through the process. The facilitator should know something about the risk management process and the project at hand, but the primary requirement is skill in drawing ideas from a diverse group and balancing the discussion. The facilitator should *not* be a major participant in the project, such as the project leader. A major player is likely to have too much of a stake in the project, which can lead to bias. Also, the major players should be devoting full mindshare to identifying risks, not running the meeting. Such a facilitator could be a senior member of another project, someone from your human resources or training department, or a consultant specialized in this field.

Make sure certain logistics are in place. You will need a room isolated from day-to-day activities and with plenty of usable wall space. Flipcharts, markers, sticky notes, whiteboards, and overhead transparencies will be needed to capture and share the risks. Finally, prepare a spreadsheet on a portable computer that can be used to record your risks. See Smith and Merritt for details on spreadsheet format.[5]

WAYS OF FINDING RISKS

There are several frameworks you can use for identifying risks. For a given project, we suggest that you pick two of them for thoroughness, one relatively specific to the needs of your project and the other intentionally broad to highlight risks that the narrower approach may miss. Here are some possibilities.

- ***Schedule-based.*** We tend to work on projects in which meeting an aggressive schedule is paramount. In this case, you can post a top-level project schedule (one that includes the activities of all organizational functions) and proceed through it phase-by-phase or activity-by-activity to precipitate risks.
- ***Process-based.*** Many important but subtle risks occur at organizational interfaces. If you have a process diagram for your project that shows how work must flow between organizational units (including outside units), you can use it to prompt risks. The facilitator simply works through it piece by piece.
- ***Work-breakdown structure-based.*** Work-breakdown structure (WBS) is a basic tool of project management (see Chapter 8). Once you have a work-breakdown structure for your project, you can use it to find project risks. However, be aware of a couple of limitations. One

is that there are various architectures for building a WBS, such as organization-based or product subsystem-based, and these will lead you to different risks; that is, the type of WBS you use will flavor the risks you find. Second, WBS tends to be a rather technical approach to project management, so there is likely to be a technical bias to the risks found.

- ***Success-thwarting.*** This is a general-purpose one. First, you reverse your perspective and identify approximately a half-dozen indicators of success for your project, such as a certain profit margins, success in a specific market, or a low level of customer complaints. Post these success factors, then ask the group what might stand in the way of achieving this picture of success.
- ***Prompt list-based.*** After you have been doing project risk management for a while, you will notice that certain types of risks specific to your business keep appearing. By capturing these and organizing them, you can create a list that you can post and use to prompt risks for the current project. Clearly, this technique will work best for a project that fits your project pattern well.

RECORDING YOUR RISKS

Regardless of the framework used to identify your risks, risk identification is essentially a brainstorming activity, so media such as sticky notes are handy for capturing each risk as it arises. Then you can easily organize them into clusters, eliminate duplicates, and combine similar ones. Referring to the risk model, for each risk you should capture both its risk event and its impact on the sticky note. After you have organized your risks, transfer the risk-event/impact pair for each risk to either a copy of the risk model or to your spreadsheet.

WHEN TO DO RISK IDENTIFICATION

Because project risk identification interacts with other parts of project planning, there is no ideal time to identify project risks. If you identify your risks too early, you will not have enough information specific to that project, so you are apt to imagine phantom risks with little basis in this project. On the other hand, if you wait until you have completed project planning, the risks you identify may then be serious enough that you will have to revise the schedule, budget, or tasks to accommodate the risks. Consequently, the best solution is to initiate project planning, then complete the initial steps of risk management (including risk identification), and finally update your project planning in light of the risks you face, as shown in Figure 13–2.

CASE STUDY BACKGROUND

To illustrate how the model and the process help you to manage a project risk, we provide a case study. This example comes from an actual project, although some names and the type of product have been disguised. Our

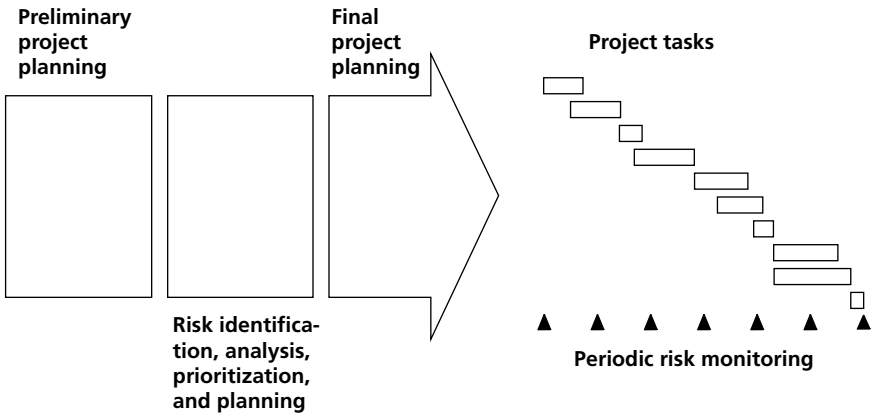

Figure 13–2 Activities specific to risk management are shown at the bottom, and other project activities are listed at the top. During the project front end, the initial steps of risk management occur after initial planning but precede final planning, and during subsequent task execution, the risk-monitoring step occurs periodically

project manager, Kim, has been assigned responsibility for delivering a prototype piece of equipment to a customer site for test and evaluation.

Kim's company develops and manufactures professional camera equipment. This new camera model has been in development for 18 months and incorporates multiple lenses along with sophisticated digital processing to produce an adjustable, wide-field image of up to 180°. For this specialized application, the company is targeting markets such as surveying and real estate companies, billboard advertisers, tradeshow companies, and print media. New technology introduced in this camera for the first time allows a significant price reduction relative to alternative solutions.

The product development team has received strong market interest in the product; however, most prospects are hesitant to purchase due to the new technology. Thus, a billboard advertising company has requested that a demonstration unit be delivered to them for test and evaluation.

IDENTIFYING CASE STUDY RISKS

Kim has been tasked to arrange and coordinate all activities regarding this customer test and evaluation (T&E). He assembled a cross-functional team to plan support for this T&E, and one of their first tasks was to develop a schedule specifying the dates and resources needed to acquire the equipment, develop the test plan, ensure that all nondisclosure agreements are in place, and stage the equipment prior to shipment.

Using the schedule-based approach mentioned earlier, the team conducted a risk identification workshop by reviewing each phase of the project

to identify any potential risk events that could disrupt the T&E. They identified fifteen risks.

One of these risks was that the prototype camera could be damaged during shipment. We will use this risk with each step of the process to demonstrate how the risk management techniques are applied. As the team discussed this risk to determine what its impact would be, they decided to review the request for proposal (RFP), which stated that this customer would commit to purchasing $15,000,000 worth of equipment over the next three years, contingent upon a successful test and evaluation of a multiple lens camera. Kim's business unit expects a 45 percent gross profit margin for specialty camera equipment. Using the gross profit margin from the RFP potential, the team determined that if the prototype equipment were damaged and the T&E could not be completed successfully by the required date, the impact would be a $6,750,000 opportunity loss.

Thus, Kim identifies this risk as

Risk event. Prototype camera may be damaged during shipment to customer test and evaluation (T&E) lab.

Impact. If the July 14 start date for the T&E period is delayed, our customer will select our competitor, which will cause us to lose a three-year contract worth $6,750,000 gross profit margin.

Step 2: Analyze Risks

Risk analysis is perhaps the most time-consuming step, and it should be done well, because it is the foundation for all that follows. If you produce a clear analysis, the rest of the process falls into place naturally with the help of the risk model.

The objective of risk analysis is to place facts under each risk to support it. These facts, which we call drivers, help you assess how serious the risk is. Drivers can make the risk either more or less serious. For instance, if the risk that concerns me is making a spelling mistake in this manuscript, then a driver that I lack a dictionary will increase this risk's likelihood, but a driver that that the spelling checker is active will decrease the chance of misspellings.

Please refer to Figure 13–1 (the risk model). In the risk identification step, you filled in the risk event and the impact boxes. During risk analysis, you will fill in all of the other boxes. Because the drivers support the information in the remaining boxes, you should complete in the drivers first, then use them to complete the other boxes. In fact, if you have difficulty in completing the other boxes, consider whether some additional drivers might help you fill in the model and thus understand the risk better.

Normally, you complete the model for one risk before proceeding to the next one. Within a risk, the preferred sequence is to list the risk event drivers

first, then use them to estimate the risk event's probability. Then proceed likewise for the impact drivers and probability of impact. Finally, estimate the total loss from your drivers.

For a given risk, you might have only a couple of risk event or impact drivers, or you might have dozens of each. As you proceed later, you should be alert to adding more drivers that might help you understand—thus manage—the risk better. You can never have too many drivers, because they put the risk on a factual foundation and help the team to reach consensus on how the risk should be handled. Otherwise, there are likely to be a multitude of opinions and no concerted action against the risk. In short, focusing on the drivers rather than the risk itself moves the discussion to a more objective level that leads to action.

Once the risk model is complete for a risk, you should calculate its expected loss from the quantities in the model:

$$L_e = P_e \times P_i \times L_t$$

The expected loss, L_e, is an overall measure of the seriousness of this risk, which is used in the next step to prioritize the project's risks. It is important to understand what this formula is saying. The total loss, L_t, is loss you would suffer if the risk and its impact happened. However, risks are uncertain, so they will only happen sometimes. The probabilities, $P_e \times P_i$, tell you what the chances of it happening are. Thus, expected loss is the total loss tempered by the chances of it happening. It is the loss you would expect, on average, from such a risk. Its main value is to compare this risk against others for the project to help you decide which ones you will devote effort toward mitigating.

There are many details involved in risk analysis that we do not have space to cover here. For example, should total loss be expressed in monetary terms, lost time, or, indeed, can you simply use high, medium, and low as loss ratings? How do you estimate the probabilities? Please see Smith and Merritt for these details.[6]

ANALYZING CASE STUDY RISKS

Now that Kim's team has determined the risk event and the impact, they are ready to do a ''deep dive'' into the risk to determine the facts, or risk drivers, that lead them to believe that this risk could occur.

The team discovered these risk event drivers:

1. Previous prototypes that have been delivered from the prototype manufacturing line have arrived damaged at customer sites 75 percent of the time.
2. The packaging material used by the prototype manufacturing line is different than the type used by the regular manufacturing line.
3. Current equipment shipper was selected solely based on their bid, which was significantly less than previous shipper.

After they listed the risk event drivers, the team evaluated the facts and estimated that P_e should be set to 0.75 (75 percent) using their expert judgment.

Next, the team listed the impact drivers:

1. Our customer has already completed evaluation of our competitor's product, and it has been deemed acceptable.
2. Our customer has committed to their executive management to replace their entire camera inventory no later than September 8.
3. Our customer has issued a request for proposal (RFP) that is worth $15,000,000 over three years.

The team must now estimate the probability of impact, which is the probability of suffering the total loss, L_t, if the risk event occurs. They decide to set P_i to 1.0 (100 percent), since they were extremely confident they would lose the business if the prototype equipment arrived damaged, because the test and evaluation would not be completed on time.

The total loss is easy in this case, because it is stated right in the impact statement: $6,750,000.

Finally, they calculate the expected loss. Recall that the expected loss is calculated by multiplying the risk event probability, impact probability, and total loss together:

$$\begin{aligned} L_e &= P_e \times P_i \times L_t \\ &= 0.75 \times 1.0 \times \$6{,}750{,}000 \\ &= \$5{,}062{,}500 \end{aligned}$$

Figure 13–3 is a representation of the completed analysis.

Step 3: Prioritize Risks

This is easily the shortest of the five steps, but it is an important one. This is where you make the difficult choices of which risks you will devote effort toward mitigating. At this point, you probably have many more risks identified and analyzed than you can afford to manage actively. Recall the insurance analogy at the beginning of the chapter. You will not only have to choose the risks against which you will take action, but you will also have to decide which ones you knowingly will leave inactive in order to limit your ''premiums.'' Every hour that you devote to managing a risk is an hour that becomes unavailable for project tasks. Although such tough choices are uncomfortable, they are advantageous to the team. By consciously deciding not to manage a certain risk (and reporting this choice to management), you will be gaining management concurrence with your choices in case this inactive risk occurs later.

There are four substeps to prioritizing. First, you arrange all of your analyzed risks in order by expected loss. If you have entered them into a

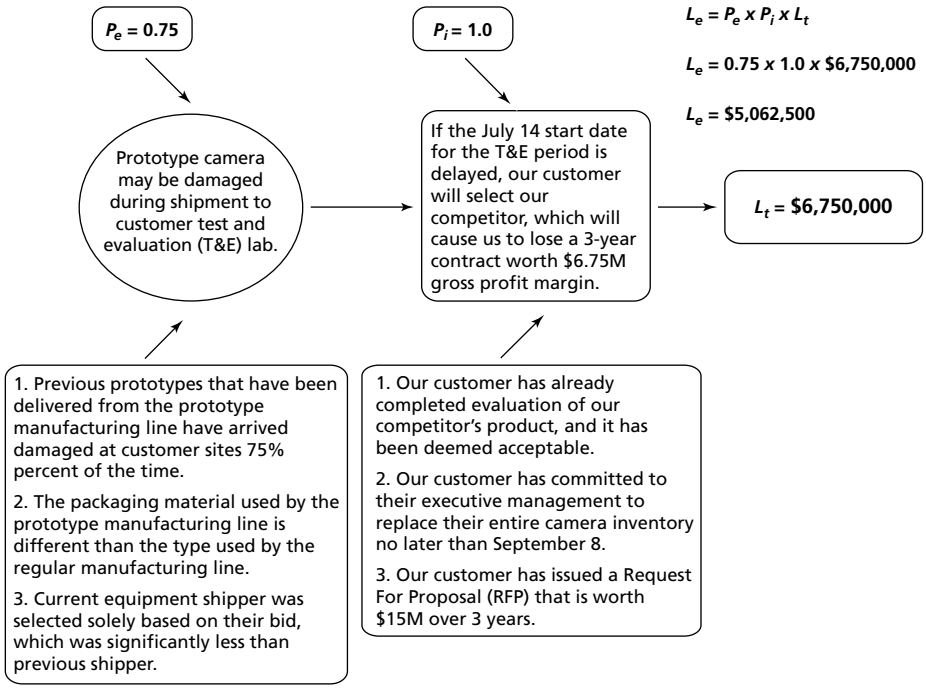

Figure 13–3 This risk illustrates the loss that could occur if a prototype camera is damaged during shipment. If the risk event occurs, the company could lose $6,750,000; however, the expected loss is $5,062,500

spreadsheet, you can do this is easily by sorting them on the expected loss column. Next, you build a risk map (see the next paragraph) so that you can see your overall risk picture for the project. Using this map, the team makes adjustments using its judgment (discussed later) to override the raw sort by expected loss. Finally, the team communicates its choices to management to gain the overall organization's concurrence to the types of risks managed and the overall level of risk assumed for the project.

A risk map (Figure 13–4) provides an excellent picture laying out all of the project's risks so that you can, as a team and in conjunction with management, ensure that you are covering your most serious risks. The risks that lie in the upper right corner of the map are the most serious ones, and the threshold line is a line of constant expected loss that roughly separates the risks above it that are actively managed from those below it that are only monitored. Smith and Merritt describe how to draw the threshold line.[7]

The risk map highlights risks that the team may wish to reassign according to their judgment. For example, a risk on the right side of the map is a catastrophic one that you may wish to actively manage regardless of its likelihood, because you cannot afford its consequences. This is analogous

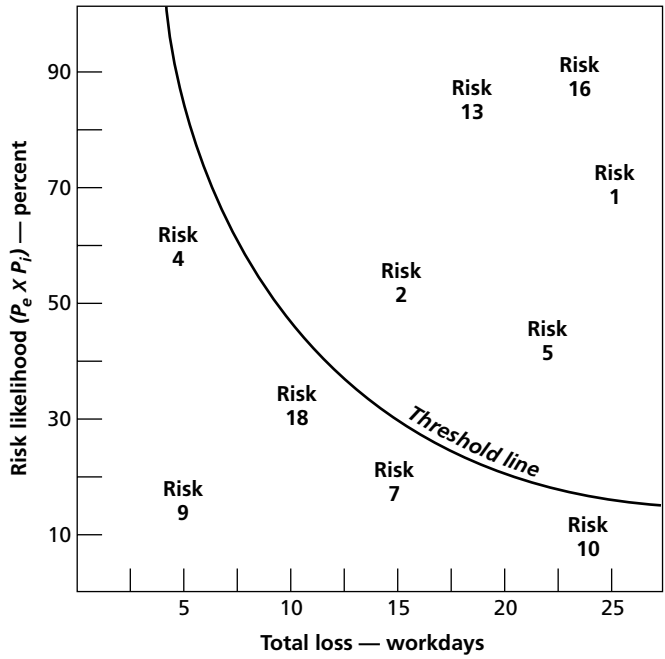

Figure 13–4 A risk map showing risks 1, 2, 5, 13, and 16 under active management and five more monitored candidates. Risk 10 could be considered a catastrophic one that the team also decides to manage actively

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to bodily injury coverage in automobile insurance. In contrast, a risk on the left side, independently of its likelihood, is one you can afford if it occurs—analogous to breakdown coverage in your automobile policy—so you can downgrade it to monitoring status. There are other strategic reasons for adjusting risks, for instance, a risk may affect the firm's reputation.

PRIORITIZING CASE STUDY RISKS

During the risk-identification workshop, Kim's team identified fifteen risks that could disrupt the upcoming test and evaluation. The team's next step was to prioritize these risks based upon their expected losses. They applied expert judgment regarding which risks to manage actively. Even though the number of risks being considered was small, the team decided to create a risk map that used the risk likelihood ($P_e \times P_i$) on the y-axis and total loss on the x-axis (see Figure 13–4). A threshold line on the risk map, which also suggested which risks should be managed actively, was used as a check on the prioritized risk list they had developed previously.

Step 4: Create Action Plans

This is where your drivers become valuable, because if they are complete and well stated, they lead you naturally to a robust set of action plans for resolving the risk. There are several different kinds of action plans, including avoiding, accepting, and transferring the risk. Here we describe only the two most common and powerful types of plan: prevention plans and contingency plans. For others, please consult Smith and Merritt, Project Management Institute, or Department of Defense.

Prevention plans are intended to reduce the probability that the risk event will occur, or reduce its impact if it does occur. With reference to the risk model, your risk event drivers prompt prevention plans. Normally, you simply proceed down through your list of risk event drivers and ask at each one what kind of action plan(s) it suggests. Some drivers will prompt multiple candidates for prevention plans, and some will not suggest any, for example, if the driver is a fact that cannot be changed. Seldom does a single prevention plan completely preclude the risk. If this is the case, you can add other prevention plans or plans of another type to reduce the risk's severity to an acceptable level.

Contingency plans deal with the risk after it has occurred to reduce its severity (although they must be planned and prepared for before the risk event occurs). Thus, contingency plans are less desirable than prevention plans, although they may be less expensive to enact. Interestingly, contingency plans are prompted by your impact drivers, just as prevention plans emanate from risk event drivers.

Moreover, the other types of action plans, such as avoidance and transfer, are also related to certain parts of the risk model, as shown in Figure 7–2 of Smith and Merritt. This is yet another benefit of using the risk model.

You will likely discover far more action plans than you need or can afford to implement. Consequently, you assess them on their cost effectiveness, that is, how much they reduce the risk's expected loss relative to what they cost to carry out. The cost can be calculated in monetary terms, effort (person-hours), or schedule slippage, whatever means the most to your project.

In general, each plan also has a trigger, that is, a time or condition at which it is implemented. For example, if you plan to prevent malaria on a trip to the tropics by taking antimalarial tablets, you need not actually start taking the tablets until you depart.

CREATING ACTION PLANS FOR CASE STUDY RISKS

The first set of action plans for Kim's project address changing the risk event drivers to decrease the probability that the risk event would occur. This is what we mean by being proactive—prevent the risk from occurring in the first place. After reviewing the first risk event driver, which was simply an historical statement of previous damage (see Figure 13–3), the team deter-

mined that one of the reasons equipment was being damaged was that those responsible for shipping were not adequately trained in proper packaging techniques; therefore, the prevention plan was simply to provide appropriate training. The second driver revealed that the packaging material used on the prototype manufacturing line was different than that used at the main production facility. (It turned out that the prototype line's packaging material was obsolete and they never were informed of the change. You can see that this opens a new line of investigation, which in fact was later pursued by the team.) Once again, a very simple prevention plan was to order the same type of packaging and to scrap the obsolete material at the prototype manufacturing facility. Regarding the third driver, the team decided that the total cost savings realized with this shipper, for all prototype shipments, was significant enough to warrant continuing to use them. However, the team did investigate previous shipments that were damaged, and they did not appear to be related to shipping and handling.

The second set of action plans deal with the unfortunate reality that some risks will not be prevented, even with the best prevention plans in place. Therefore, the team reviewed the impact drivers for possible actions to be enacted in the event that the risk event still occurs. The first impact driver dealt with the fact that the customer has already evaluated the competitor and deemed their solution to be acceptable. The team realized that their ability to change this driver was too limited to consider pursuing. They then evaluated the second impact driver to see what could be done. Kim's team learned that the entire inventory of older cameras was being replaced with this next-generation camera, which had to be completed by September 8. Apparently, the inventory replacement date was triggering the July 14 deadline. The team decided to ship spare prototypes in case one of the primaries failed, which would enable the test and evaluation to continue. The last driver was the key piece of data to allow the team to fully determine the total loss they could be facing. No contingency plans were needed to change this driver.

Step 5: Monitor Progress

The previous four steps are executed at the outset of the project, as explained in connection with Figure 13–2. In contrast, this one occurs regularly throughout the project, as indicated by the small triangles in Figure 13–2. How often is ''regularly''? Our answer stems directly from the concept of proactivity: by managing project risks, you are trying to preclude problems with the project's budget, schedule, or outcome. Consequently, you should monitor your risks as frequently as you monitor project budget, schedule, or outcome.

Many tools are available for monitoring a project's risk, so you can choose one that fits you needs and style:

- ***Tracking list.*** This is simply a list of your active risks (the ones with action plans) for the project followed by the inactive (planless) ones, showing the current expected value for each one.
- ***Tracking chart.*** Here you create a thoughtfully formatted one-page chart for each project risk, for example, see Smith and Merritt.[8] Relative to the tracking list, this one has the advantage of showing much more detail for each risk, such as its prevention plans, but the corresponding disadvantage that you cannot see all of your project risks at once.
- ***Graphical tracking list.*** This one is like a tracking list but is portrayed as a chronological bar chart; see Smith and Merritt.[9]
- ***Risk map.*** Using a chart like Figure 13–4, you can add expected loss trend information by simply showing the trajectory of each risk on the map over time (for both active and inactive risks). You can add a legend that indicates the dates involved. This is an excellent portrayal to illustrate your progress to management; the goal for each active risk is to move it below the threshold line, and you can check your inactive risks to see that they remain below the threshold line.
- ***Risk dashboard.*** This is a collection of telling metrics for the project that illuminate various facets of your risk mitigation performance, much as a car's dashboard indicates the car's health by various measures. See Figure 8–6 in Smith and Merritt, and note that this dashboard is an aggregate that hides the status of any individual risk.

An important part of the ongoing risk-monitoring step is scanning for and processing any new risks that appear while you are working on the project. The project's environment is in constant flux, and you may also notice risks that had not been apparent before, for example, risks that occurred on sister projects. Any new risks you find should pass through mini-versions of steps 1–4 and then be treated the same as the older risks.

Conversely, as you monitor your risks, if you find ones that have passed below the threshold line (regardless of the monitoring medium you use), you should retire their action plans. This will conserve resources that you are putting into actively managing them, and it will keep your active list uncluttered so that you can see your currently most serious risks clearly.

MONITORING CASE STUDY RISKS

Kim takes the leading role in monitoring implementation of the action plans and will ultimately be the decision-maker for enacting the contingency plans, if needed. These action plans are entered into the project schedule and treated like any other task needed to complete the project.

Outcome: The team's efforts paid off: the equipment arrived undamaged after the prevention plans were implemented successfully. However, during the T&E period, one of cameras developed a latent defect that ultimately turned out to be related to a faulty component. The on-site test engineer had to bring in a spare to enable the T&E activity to continue. The testing was completed successfully and, after root cause analysis of the defective

camera was provided to the customer, Kim's company was awarded the three-year contract.

Implementation Pitfalls

We close with a few cautions to keep in mind as you build your project risk management capability.

First, do not think of risk management as only identifying your risks (our step 1). Curiously, many project teams do this unwittingly, and it is worse than doing nothing at all. When the risks they had identified start occurring later but they had done nothing to preclude them, they are embarrassed. You gain benefit from the process only when the later steps are completed and your action plans take effect.

If you are applying this technique to product development, your team is likely to be dominated by engineers, and they have a tendency toward analysis. You do not need complex analysis, high-precision probabilities, or computer simulations of your risks in order to manage them well. Understanding your drivers and building consensus around the actions you will take are far more important.

Using the risk model, finding and stating drivers, and jointly understanding the terminology we have used (such as *expected loss*) do not come automatically. Plan to train your teams in these techniques and try the process out on a real project. Also plan to train management in the basics, or they are likely to argue with the model and your definitions of terms when they review your risk management results.

As suggested at the outset, risk management can never be perfect, and it can become quite expensive if you try to approach perfection. Think of it instead as a means to improve your odds and to choose the areas in which you wish to accept uncertainty. Viewed in this way, risk management can yield great rewards for what it costs you.

Finally, it should be clear by now that managing the risks in your project must be a cross-functional activity. Make sure that you maintain involvement from all key functions throughout, in particular with your ongoing risk identification and monitoring.

ENDNOTES

1 Smith, Preston G. and Merritt, Guy M. *Proactive Risk Management: Controlling Uncertainty in Product Development*. New York: Productivity Press, 2002

2 Project Management Institute. *A Guide to the Project Management Body of Knowledge*. Newtown Square, PA: Project Management Institute, Inc., 2000

3 Department of Defense (DoD). *Risk Management Guide for DoD Acquisition*. Fort Belvoir, VA: Defense Acquisition University Press, 2001

4 Software Engineering Institute. *Software Acquisition Risk Management Key Process Area*, Version 1.02. CMU/SEI-99-HB-001. Pittsburgh, PA: Software Engineering Institute, 1999

5 Smith and Merritt, pp. 44, 122
6 Ibid., pp. 68–80
7 Ibid., pp. 90–91
8 Ibid., p. 124
9 Ibid., p. 126

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