Risk Management

BY PERRY WEST
APPENDIX B – RISK CREATING CHALLENGES ............................................................................ 28

Incomplete or even non-existent requirements .............................................................................. 28
Reliance on poor indicators of risk .................................................................................................. 28
Scheduling errors ............................................................................................................................. 29
Ignoring the human aspects of the project/task/assignment ........................................................ 29
Only asking, “When will it be done?” ................................................................................................ 30
Excluding time to include the voice of the customer ........................................................................ 30
Identifying risks and taking no action on them ............................................................................... 30
Not identifying risks ......................................................................................................................... 30
Insufficient resources ...................................................................................................................... 30
Competing priorities or initiatives ................................................................................................... 31
Corporate culture ............................................................................................................................. 31
Lack of executive sponsorship ........................................................................................................ 31
Lack of perceived value ................................................................................................................... 31
Difficulty in proving the business case ........................................................................................... 31

REFERENCES ............................................................................................................................. 32

Table of Figures

Figure 1 – A Risk Register Template ..................................................................................................... 7
Figure 2 – Risk Impact Scale ................................................................................................................ 8
Figure 3 – Risk Probability Scale .......................................................................................................... 9
Figure 4 – Initialized Risk Register Example .................................................................................... 9
Figure 5 – Risks Displayed Graphically ............................................................................................. 10
Figure 6 – Example Risk Register with Scores Calculated ................................................................. 16
Figure 7 – Example Risk Register with Management Strategies Identified ....................................... 16
Figure 8 – Risk Graph Showing Risks to Accept ............................................................................... 17
Figure 9 – Example Risk Register with Total Risk Score .................................................................... 17
Figure 10 – Resolved and Unresolved Risks Over Time ................................................................... 20
Figure 11 – PERT Diagram with the Critical Path (0, 1, 5, 7, 8) Highlighted .......................................... 26
“Risk is inseparable from opportunity …”
Anonymous

Every project involves risks

There are many approaches to risk management. Large organizations manage complex and very costly projects. They can afford to employ a team of experts to manage risks using very sophisticated and complex tools. Smaller organizations, less ambitious projects, or individuals cannot afford the cost of these sophisticated approaches or the hours of work it takes to make use of them. Fortunately, for small to modest size projects, a more streamlined and efficient method is entirely appropriate.

This paper covers a straightforward approach to manage risks that works in almost every situation and success as well in business projects, like selling and human relations, as it does in technical projects like programming or mechanical engineering.

Modern management practice has redefined the idea of risks, and if you have not revisited the topic recently, you may be surprised at how this concept has changed. Before tackling the management of risks and learning some useful tools, it is necessary to know the techniques of risk management available to you. You have probably used a number of the techniques in your work and knowing a brief array of general techniques can help you be more creative and more productive in your work.
WHAT IS RISK?

“Go out on a limb, that’s where the fruit is.”
Jimmy Carter, 39th U.S. President

A risk is any event or condition that may keep you from completing your work according to your plan. It has both a probability of occurring and an impact on a project’s cost, schedule, quality of deliverables or a combination of the three. The probability of a risk’s occurrence cannot be zero, meaning there is no expectation of its happening, in which case it does not have any impact on the project. Likewise, the probability of a risk’s occurrence cannot be 100% because the event and its impact will happen; it is not a risk but a clearly identified facet of the project.

Classically, a risk’s impact was always adverse. However, modern risk management has changed from considering a risk as only having a negative impact to one having a negative impact, a positive impact, or potentially either a negative or positive impact.

Take a hypothetical example of a product design project. The designers know a certain, expensive component is certain to work, but a far less expensive component has a possibility of working, but only testing of the final design can tell if the less expensive component is acceptable. The project plan could incorporate the less expensive part with the risk of having to redesign to use the more expensive part – a negative impact. On the other hand, the project plan could incorporate the more expensive part with a test of the less expensive one. If the less expensive part proves to be acceptable, then the impact is positive.

Very sophisticated risk analysis procedures have two probabilities – one for the event’s occurrence and one for the impact happening if the event occurs. Likewise, sophisticated risk analysis takes into account a range of possible impacts if a given event happens. Such detailed and data intensive analysis is appropriate for large, complex, and extremely expensive projects with a team of experts to manage risks, but for small to mid-size companies, projects with small staffs, and individual contributors, this depth of analysis is impractical and, in fact, unnecessary.

This paper considers a risk as having a single identified impact and a single probability of happening. Precise appraisals of the impact and probability are actually not necessary. Your qualitative judgment based on relevant experience along with input from other project stakeholders is all you need.
“People who don’t take risks generally make about two big mistakes a year. People who do take risks generally make about two big mistakes a year.”

Peter Drucker

People and organizations have different levels of risk tolerance. Some are risk adverse, some are risk neutral, and some are even risk seeking.

Risk adverse people or organizations do not accept serious risks – those risks having either a high probability of occurrence or a strong negative impact. They insist on avoiding serious risks even if it means cancelling a promising project. While there are projects a risk adverse organization or person should avoid, there are also projects with risks the same person or organization will accept if the risks are managed well.

Risk neutral people or organizations can accept risks, sometimes even serious risks, but they insist on careful management of all risks.

Risk seekers thrive on risk. They see risk as a challenge with the potential for greater achievement. While they do not want to fail, they are not fearful of failure. Often, they are impatient and may not support careful risk management. They prefer to deal with negative events when they occur as a means of getting faster project execution. For these people or organizations, risk management must consume very little resources.
“The greater danger for most of us lies not in setting our aim too high and falling short, but in setting our aim too low and achieving our mark.”

Aristotle

There are five steps to risk management:

1) Identify – list all foreseeable risks for the project
2) Evaluate – appraise each risk for both its impact and its probability
3) Plan – decide how to manage each risk based on its impact and probability
4) Monitor – during the project insure risks are resolved and identify any new risks that emerge and decide how to manage them
5) Audit – at the conclusion of the project review the project risks and how effectively they were managed

The remainder of this paper explores these steps in detail.
IDENTIFY RISKS

“I’m not concerned about all hell breaking loose, but that a part of hell will break loose — it’ll be much harder to detect.”

George Carlin

We base project plans on facts, estimates, and assumptions.

By definition, facts are certainties with a known impact either positive or negative. In practice, we consider facts as truths because we believe they are verifiable. Therefore, we do not consider facts as risks. While facts may be true at a given point in time, either in the present or in the past, circumstances may cause a fact to become false. For example, the people assigned to work on a project are facts when we make the project plan, but for any number of future reasons, one or more of these individuals may become unavailable to the project.

Estimates are data, usually about the future, based on educated judgment or experiences. We should always evaluate estimates as potential risks.

We all make assumptions and often treat these assumptions as facts even though they are not directly verifiable. Since we cannot know everything or predict future events, we need assumptions. We also need assumptions because it is impossible for us to be fully informed about every detail related to our project. Since we base most assumptions on our life experiences, many turn out to be true. Assumptions carry with them implied certainty, or uncertainty, and an impact if the assumption is not correct. The danger is we come to think of assumptions as grounded truths or facts instead of educated judgments, and, in so doing, miss identifying them as risks we should manage.

Some assumptions are explicit and we evaluate them as risks. But often assumptions are implicit. For example, a culture is a set of assumptions shared by a group. Every company has its own culture; this means its staff shares certain assumptions that are not open to evaluation. Implicit assumptions are the most difficult to deal with when trying to identify risks.

SOURCES OF DATA

“It is a capital mistake to theorize before one has data.”

Sir Arthur Conan Doyle
Your first source of data is the history of similar prior projects. Find out what risks the project teams managed, how they managed each risk, and how successful they were with the management of each risk. Also, find out about unanticipated events experienced in the projects (unmanaged risks), how the project staff discovered these risks, and what they did about them. Then evaluate whether these risks are present in the project being managed and, if so, their impact and their probability.

If previous project teams undertook post-project audits at the conclusion of their projects then finding out the history of risks and their management becomes straightforward. (This paper discusses post-project audits in a later section.) If the enterprise does not do post-project audits, then the only source of history is the individual and collective memory of people in the organization. Such memory is not always reliable, but it may be the best available.

Your second source of data is the project stakeholders. There are several techniques available to you to work with stakeholders to identify risks. A few you might employ:

- Interviews
- Brainstorming – do this without evaluation; the evaluation occurs after brainstorming
- Delphi study – a critical evaluation of the project plan with a second round of evaluation of the critiques
- Project pre-mortem – a hypothetical post-mortem at the beginning of a project

You will probably identify other sources of data specific to your project. In some cases, suppliers of key materials or services are able to identify risks based either on their own internal operations or on their experience with other customers.

A third source of risk information is any project planning documentation such as work breakdown structures or network diagrams.
As you identify and evaluate risks, create a risk register somewhat like what is shown in Figure 1.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Impact</th>
<th>Probability</th>
<th>Score</th>
<th>Management</th>
<th>Owner</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identified risk #1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identified risk #2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identified risk #3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1 – A Risk Register Template

A spreadsheet program is most convenient for collecting this data. Do not be concerned about assigning impacts and probabilities until after you identify all the risks.
EVALUATE THE RISKS

“Probability theory is nothing but common sense reduced to calculation.”
Pierre Simon Laplace

Usually, you do not know the impact precisely or it is too costly for you to determine with precision. Except for very complex projects, precision is not necessary and a qualitative ranking is quite acceptable for risk management purposes. For each identified risk, rank it using a subjective scale. A range of 1 to 5 is usually sufficient. An example of a useable scale is given in Figure 2.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Insignificant: &lt;1% change to budget and/or schedule</td>
</tr>
<tr>
<td>2</td>
<td>Minor: 1%-10% change to budget and/or schedule</td>
</tr>
<tr>
<td>3</td>
<td>Moderate: 10%-25% change to budget and/or schedule</td>
</tr>
<tr>
<td>4</td>
<td>Serious: &gt;25% change to budget and/or schedule</td>
</tr>
<tr>
<td>5</td>
<td>Showstopper: inability to meet minimum project requirements</td>
</tr>
</tbody>
</table>

The impact is the consequences the project suffers if the risk materializes. Traditionally, a positive value indicates an adverse impact because it adds to the project’s cost. For favorable impacts, use a negative value.

Every person or organization will have their own scale for rating impacts. However, avoid fine-grained scale – one with many ranks. The fine grain implies a precision in assigning impacts that is not truly present or requires significant analysis to make a correspondingly precise evaluation. The next section looks into managing risks where it is evident a fine-grained scale is not necessary and does not add significant value.

From a practical standpoint, you cannot usually estimate probability with precision. Also, remember the risk’s probability normally changes during the project execution, and too precise an estimate simply increases the burden of risk management as the project progresses. Again, a qualitative scale is appropriate, and, again, a fine-grained scale is impractical and adds little value. A suggested scale is given in Figure 3.
Rank | Probability
---|---
1 | Improbable: <10% chance of occurring
2 | Low: 10%-40% chance of occurring
3 | Moderate: 40%-60% chance of occurring
4 | Likely: 60%-90% chance of occurring
5 | Almost certain: >90% chance of occurring

Figure 3 – Risk Probability Scale

<table>
<thead>
<tr>
<th>Risk</th>
<th>Impact</th>
<th>Probability</th>
<th>Score</th>
<th>Management</th>
<th>Owner</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk 1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 2</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 3</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 4</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 5</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 6</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 7</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4 – Initialized Risk Register Example

As you evaluate each risk, add its impact and probability ranking to the risk register. For an example, see Figure 4.

You may find it very useful to create a graph of the individual risks as shown below in Error! Reference source not found. Spreadsheet programs make this step extremely easy.
The next section shows how you to use this chart to select the management technique you will use for each of the risks.
“Errors using inadequate data are much less than those using no data at all.”
Charles Babbage

NEGATIVE RISK MANAGEMENT TECHNIQUES

In your risk management toolkit, you have five principal management strategies for negative risks:

- Mitigate
- Avoid/Eliminate
- Accept/Ignore
- Contingency
- Transfer

**Mitigate**

Using this technique, you redesign the project to reduce the risk’s impact or probability or both but do not eliminate the risk.

One of the most common techniques for mitigating a risk is to move the portion of the project having the risk as early in the schedule as possible. That way, if the risk materializes, sunk cost is low and there is more time, and perhaps resources, available to work around the impact. This technique for risk management is summed up best by this quote by an unknown source, “Failure is acceptable, but fail fast and cheap.”

Imagine you have a client who retained you to setup manufacturing operations for a new type of light bulb. Of course, you recognize fabrication techniques that worked in R&D might not work in manufacturing. Also, you have to deal with the possibility the quality of the light bulb, say its lifetime, when made by the new manufacturing techniques is not as good as those produced in R&D. You would probably start by setting up a pilot production line and some life testing equipment. By doing this, you have mitigated the risks – they are still present, but with the pilot production line you resolve them earlier, with less sunk cost, and without disturbing ongoing operations. The risk is lower than you would have incurred if you had built a high-volume production line without managing these risks.

Another common way to mitigate risk is to structure a project in phases with a review and gate between each phase. The work in the current project phase usually makes risks in the subsequent phase more identifiable, better understood, and more manageable. If necessary, you can redesign the subsequent phase to manage the risks better before making the decision to proceed.
Another very common way to mitigate risk is to pad the schedule or the cost projection. Most managers commonly use this approach. In many cases, a manager adds padding as an overarching judgment without identifying individual risks – the proverbial multiplier. The problem with using multipliers is they do not identify the individual risks and do not allow you to manage those unidentified risks. Also, in some organizations, each layer of management applies its own multiplier to the project’s plan; the result is the plan becomes bloated and liable to cancellation. A related problem with applying multipliers is the people working on the project learn the managers above them use multipliers to pad the schedule and they therefore have more time than they originally forecasted. This leads to inefficiency.

Applying a padding as a risk management strategy is actually sound if it is done on a risk-by-risk basis. A common practice in project planning is to provide three estimates, ideal, realistic, and pessimistic, for each project line item. The spread between the ideal and pessimistic estimates sheds light on the uncertainty or risk. For project activities with a large spread, using an estimate above the “realistic” estimate as a means of mitigating the risk is a reasonable and effective management tool.

Another mitigation technique is to minimize the time to project completion. Minimizing time helps protect against external factors like economic cycles or the escalation of material prices.

Still another technique for mitigation is diversification. You see this commonly in investments, but it has application in other aspects of business. For example, insuring there are multiple suppliers for a given component is a form of diversification. If one supplier has difficulties, the total impact is limited. Also, the second supplier may be able to fill a portion of or all of the unmet requirement.

**Avoid/Eliminate**

Some risks are just too onerous to be tolerated, and you must redesign the project to eliminate those risks. Risk averse people and organizations strongly prefer this management technique for high impact risks. Most showstopper risks fall into this category.

You can effectively avoid a risk by redesigning the project so the risk is not part of the project scope. In the extreme case, this may lead to cancelling the project.

Say you are in charge of moving your company to a new accounting system. You have the choice between an upgrade software package from your current supplier and a more desirable software package from a competing supplier. However, you find there is a risk the accounting database will not migrate to the preferred software package without significant problems. You might elect to avoid this risk by choosing the upgrade from the existing software supplier.
Another example illustrates how to avoid risks. Suppose you are responsible for developing a sub-system for a client’s product. During your interviews prior to bidding the project, you discover there are significant temperature issues. You recognize these issues can cause problems in a number of different ways, but you are not qualified to do the thermal analysis to find solutions. Identifying this risk to the client and constraining your bid to making the sub-system work only at room temperature is one way for you to avoid the risk.

Before choosing to avoid a risk, you should carefully consider the other risk management alternatives.

**Accept/Ignore**

“Ignore” almost means what it implies in this context. You elect to accept the risk but ignore dealing with its impact until and unless the risk occurs. If the risk occurs, you decide then how to deal with it. Of course, you must still monitor for the risk’s occurrence so continuing neglect does not amplify its impact.

Clearly, you can handle risks with small impacts and low probability of occurrence in this manner. Equally clearly, the risks with the very highest impact – showstoppers – are ones you cannot ignore.

For example, you are managing a project that is ordering some parts from a vendor. The vendor has a good, but not perfect, record for delivering parts meeting specification. If a part does not conform to specification it needs to be reworked, but the vendor can perform the rework in a day or two. Because the probability and the impact are low to modest, you might ignore this risk, and, if the impact occurs, deal with it then by having the part reworked. However, if the rework could take a month or more, then the impact due to schedule delays may be too high, and you would need to employ other management strategies for this risk.

**Contingency**

Managing risks with a contingency means you have an alternate plan. Sometimes the alternate plan is a backup – prepared but not executed unless the risk materializes. Sometimes, if resources permit, you execute the alternate plan in parallel; this is sometimes called double-betting. Then if the preferred option fails, the result from the contingency option is available to keep the project moving with minimum impact on the schedule.
For example, suppose you are given the task of designing a new product. You have a choice of two materials, one less expensive than the other. However, you know the more expensive material will work but do not know if the less expensive material will work or not. You might structure the project to build several prototypes some with one material and some with the other. When evaluating the prototypes, you will know if the less expensive material will work and, even if it does not work, still have a working design for the product using the more expensive material.

**Transfer**

You can transfer the burden of a risk to an outside individual or organization with greater expertise in the particular area than possessed by any member of the project team. Perhaps the most common technique used, and misused, for risk transfer is purchasing insurance. Companies who sell in foreign currencies often purchase futures contracts in the currency to protect them against unforeseeable exchange rate variations.

Risk transfer is a common reason for hiring consultants. Consultants offer their clients access to a high level of knowledge and experience in a specific area avoids or minimizes risks. The use of fixed price contracts also is a means of transferring the risk from the contracting party to the contractor.

Imagine you have skills in logistics and computer systems and your project is to design a new warehouse. While you can do most of the critical work, you may need to employ an architect to design the building modifications to your specifications and you may need to hire another expert to help select the right forklift. What would be significant risks for you to perform are well within the capabilities of these other experts to manage.

One caveat of transferring risk, the person or organization accepting the transferred risk never wants the owner of the risk to transfer 100%. If all risk is transferred, the owner has no incentive to prevent the risk from occurring.

**POSITIVE RISK MANAGEMENT TECHNIQUES**

For positive risks, there are four techniques available to manage them:

- Exploit
- Enhance
- Share
- Accept/Ignore
Exploit
Exploiting the opportunity is the “go for it” strategy. You include the event in your plan and manage in a way to make it likely to happen. However, when doing this, you are inherently creating a negative risk the opportunity does not materialize, and you also need to have a management strategy in place for the resulting negative risk.

Enhance
You enhance the opportunity when you take steps to increase its probability or its impact. For example, if you see there is the 50% possibility of replacing a six-dollar part in your product with a four-dollar part, you do one of two things or both. You can look for an even less expensive part that may also work. You might look at how to change the design of the product to increase the likelihood the less expensive part will work.

Share
Sharing the opportunity is analogous to transferring negative risk. In order to realize the opportunity, you involve a collaborator who has skills and resources to make the opportunity happen.

Accept/Ignore
This is identical to the accept/ignore strategy for negative risks. You simply monitor the project for the occurrence of the opportunity and take no significant action to enhance its probability or impact. If the opportunity does materialize, you decide then what to do about it. Among the options available is to continue to ignore the opportunity in favor of focusing attention on the project’s goals.

COMPUTE EACH RISK’S SCORE
A risk’s score is simply the product of its impact ranking and its probability ranking as shown in Figure 6.

In the real world, it is impractical to actively manage all risks. So, you need a mechanism to decide which to manage and which to accept. You select some threshold for the risk scores. Any risk scoring above the threshold you actively manage, and any risk scoring below the threshold you accept and monitor.

There is one exception to the use of the threshold. Any risk that is a showstopper, with an impact of 5 in our example, requires active management.
<table>
<thead>
<tr>
<th>Risk</th>
<th>Impact</th>
<th>Probability</th>
<th>Score</th>
<th>Management</th>
<th>Owner</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk 1</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 2</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 3</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 4</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 5</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 6</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 7</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 6 – Example Risk Register with Scores Calculated

Let's say the threshold is set at 6. Then our risk register looks like what is shown in Figure 7.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Impact</th>
<th>Probability</th>
<th>Score</th>
<th>Management</th>
<th>Owner</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk 1</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>Accept</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 2</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>Manage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 3</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>Accept</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 4</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>Accept</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 5</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>Manage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 6</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>Manage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 7</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>Manage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 7 – Example Risk Register with Management Strategies Identified
You can use your graph to help you make a practical decision as to where to set your threshold. See Error! Reference source not found. for an example.

The grayed area shows where you accept, but monitor, the risks as your strategy. Note Risk5, being a showstopper, cannot be ignored even though its probability is low.

**HOW MUCH RISK IS TOO MUCH?**

You can assess the project’s net risk by determining the total risk score: summing the product of each risk’s impact times its probability over all risks. This is shown in Figure 9. Impacts that are benefits are negative, while impacts that are detriments are positive. Risks with negative impacts tend to help offset those with positive impacts. It is important the project have contingency resources available to handle the net risk.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Impact</th>
<th>Probability</th>
<th>Score</th>
<th>Management</th>
<th>Owner</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk 1</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>Accept</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 2</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>Manage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 3</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>Accept</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 4</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>Accept</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 5</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>Manage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 6</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>Manage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk 7</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>Manage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>44</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 9 – Example Risk Register with Total Risk Score
A risk adverse organization usually accepts almost no net (positive) risk. If the project has an adverse net risk, you may need to return to the project plan to see how you can reengineer the project to eliminate more of the impacts with adverse outcomes.

Risk neutral organizations usually accept a small amount of adverse net risk, say around 10% of the total project budget. However, they also demand careful management of the risks.

Risk tolerant organizations usually accept a larger adverse net risk, perhaps in the order of 25% to even 50% of the project budget. It is important to be sure the organization is not simply passively accepting the risk, but actually has the funds to handle this risk.

Risk seeking organizations are rare, but they demand a project have a high adverse risk and budget accordingly. If the project does not have a high adverse risk, it is likely they will insist the project plan be recast to be more aggressive.

**FINAL REMARKS ABOUT THE RISK REGISTER**

The remaining two right-hand columns on the risk register are for the risk’s owner and the risk’s status.

The risk’s owner is the stakeholder who is impacted by the risk’s occurrence. They may not be the one responsible for managing the risk. For smaller projects with few direct stakeholders, this column can be eliminated.

The risk status is either pending for risks that have not had the chance to occur, active for risks that have occurred and are being handled, or resolved for risks that either did not occur or for risks that did occur but were resolved through action.
MONITOR THE RISKS

“Reality isn’t the way you wish things to be, nor the way they appear to be, but the way they actually are.”
Robert J. Ringer

“Okay, who put a "stop payment" on my reality check?”
Author Unknown

Having a risk management plan in place is obviously not the end of risk management, but a necessary beginning making it practical to manage the risks during the project.

Risks must be reviewed regularly and frequently. If the project includes status meetings with stakeholders, a review of risks should be a part of every meeting. Each time the status of a risk changes, update the risk register. If a new risk arises, immediately add it to the risk register.

You need to watch all identified risks, even those you elect to manage by accepting (ignoring) them. For each risk, regardless of what technique you use to manage it, you should identify a trigger event. The trigger event is a first indicator the risk happened. If you want, you can expand the risk register to include identification of the trigger event.

Common trigger events are:
- A variance in the schedule; usually a task did not complete on time. Interestingly, even if a task finishes early, there is also a need to understand why.
- A variance in cost to budget for a task. Usually the task is over budget, but if it finishes under budget there may be a positive impact or there may be a hidden quality issue.
- A task that completes with less quality than expected. This can pose a risk to a follow-on task dependent on the completed task results.

Often the trigger event is very simple. Let’s consider the case where a person is handling arrangements for their company’s booth at a trade show. Among the many tasks to be managed is getting collateral material printed. The trigger event would be the printer’s failure to deliver the printing on the promised date. There may still be time before all the material needs to be shipped, but this trigger event would alert the person managing the arrangements to take action.

The failure to make delivery on time is an example of a concurrent indicator – the trigger event is concurrent with the risk being realized.
Even better than a trigger event is a leading indicator. A leading indicator is something that happens in advance of the trigger event indicating the risk has increased. Let’s take the example above of having materials printed. One of the steps in the printing process is having printing plates made. If the plates are not made when the printer planned, it is still possible the printer will deliver on time, but less likely than if they had made the plates on time. The leading indicator shows when the risk increases.

Of much less usefulness are lagging indicators. In the example above, if the check on completion happened when the trade show exhibit was set up, it would be very difficult to affect any remedy.

The most common lagging indicator is accounting data. Accounting data is historical and can lag events by a month or more. For most projects, this lag likely results in added costs and delays.

Risks change during the project. Identified risks disappear because the project passes a point where it is possible for them to happen. Other risks may have their probabilities increase or decrease because of new information that becomes available, and you need to review your management strategy for these risks. Finally, it is common for unidentified risks to emerge requiring evaluation and management. See Error! Reference source not found..

As the project progresses and risks are resolved – they either go away or occur and must be integrated into the action plan, the residual net risk changes. One aspect of risk management is to insure the remaining net risk never exceeds the available resources.

As the project progresses and you are better able to evaluate the remaining risks, there is the temptation to change the method of management of those risks that changed. Unless a risk changes significantly in impact or probability, changing how you manage the risk may add complexity to the project and require resources you could better deploy on execution rather than management. However, when a risk does change dramatically, it is essential you review how best to manage the risk given the new information.
One characteristic of risk management that alarms many managers is that as the project progresses, the number of risks, and sometimes their probability, increases. Some increase in the number of risks you are managing is inevitable as more details of the project emerge. This is not really a cause for alarm. At some point, the number of unresolved risks under management begins to decline, and this event is a true milestone in risk management of the project.

When a risk becomes a reality, it materializes, it becomes an issue. Issues require active management.
When the project is finished, it is essential for the organization to review the project risks and how the project team managed them. Here are two questions you should ask about each risk:

1) Did the team identify the risk and correctly evaluate it?
   Look especially at risks you did not identify at the project’s inception. Should you have been able to anticipate the risk? Also, for each risk you managed, check to see if you evaluated its impact and its probability correctly.

2) Did you manage the risk effectively, or should you manage a similar risk differently in the future?
   You may find you could have managed some risks more aggressively. For example, perhaps you could have avoided a risk altogether rather than incurring the cost of mitigating it.
   Maybe you managed some risks too aggressively, consuming resources that would have been better spent on other aspects of the project.

The information from the recap provides valuable insight you and your organization can carry into future projects to improve project management.
“The unseen enemy is always the most fearsome.”
George R.R. Martin

Long ago, it was widely known there were no black swans. Then black swans were observed in the wild, and the term “black swan” became a metaphor for an unknown thing – something not even conceivable because there is no evidence for its existence – even if it does exist. So, in project management and risk analysis, a black swan is an unknown unknown. When a black swan does appear, it usually carries a significant impact.

Contrasting with the black swan is the white swan. This is a metaphor for a known unknown. Something a person knows exists or can exist, but for which they have no evidence or information. In essence, a white swan is a known unknown.

It is impossible to evaluate or manage white swans because their probability and impact are unknown. It is often possible, though, to identify a trigger event that identifies the potential appearance of a white swan. When the trigger event happens, it should be possible to evaluate the risk and determine how to manage it.

Imagine you are starting a business to harvest sea urchins and sell them to a foreign country. The quantity of sea urchins is extensive, and while there are stories about its population declining, there is no evidence to support this or suggest its cause, probability, or impact. Also, foreign politics is fickle. There could be an import or an export embargo put in place if trade relations with the foreign country deteriorate. So, this venture would face two white swans: insuring a sustainable population of sea urchins, and the continued good trade relations between two countries.

The black swan is perhaps more insidious. People managing a project are unaware of its even being a possibility. That won’t prevent someone in an audit to suggest it should have been foreseeable.

Let’s take as an example you have invented a new food product made from soybeans that promises to become very popular. The government has been encouraging and even subsidizing the growing of soybeans. Wouldn’t it be a surprise if the government discovered, say, soybeans caused cancer and banned them from food products? There would be no way to anticipate that development yet it would decimate the business venture.
Although both white and black swans might exist, it takes too much effort and causes too much stress to try to identify and deal with them. For suspected white swans, try to identify a trigger point. For black swans just accept if they emerge, you will deal with them to the best of your ability.
This paper gives you insights and tools on how to manage risks efficiently and effectively when coupled with your expertise. It reinforces the principle that risk management is an expected part of a project. It shows you how to identify and evaluate risks. For each adverse risk, you can elect one of the five management techniques to apply to it: mitigate, avoid/eliminate, accept/ignore, contingency, and transfer, and for each favorable risk you can elect one of four management techniques for it: exploit, enhance, share, or accept/ignore. Also, you know during a project’s execution, you continually eliminate risks, but some risks change and you discover new risks. Do not underestimate the importance of an audit of the project’s risk management after the completion of the project. The audit enhances your ability to manage risks on future project and increases your value to your clients. Finally, accept that white and black swans exist, and you must deal with them if they occur.
Some risks deserve closer attention than others. There are two tools to help you partition your attention effectively, the PERT diagram, and the tornado diagram.

PERT stands for Program Evaluation and Review Technique. It uses dependencies for each step in a project along with the estimated time for each step to create a diagram showing how all the steps link together. It also identifies the critical path – the chain of project tasks that paces the completion date of the project. If any task on the critical path takes longer than anticipated, the expected completion date changes by an equal amount. If a task not on the critical path takes longer than planned to complete, then either the end date is not impacted or the delayed task causes the critical path to change to include it.

![Figure 11 -- PERT Diagram with the Critical Path (0, 1, 5, 7, 8) Highlighted](image)

It is clear that management of risks requires tasks on the critical path and the risks associated with them receive close attention.

Another technique used for managing risks is the tornado diagram. This is similar to a Pareto diagram which lists objects in order of their significance. In the tornado diagram assembles risks in order of their uncertainty.
The risks with the biggest uncertainty range need to be watched with special care as they are the ones that have the highest likelihood of not going according to plan.

Figure 12 – Tornado Diagram
APPENDIX B – RISK CREATING CHALLENGES

INCOMPLETE OR EVEN NON-EXISTENT REQUIREMENTS

No one likes to undertake something where the requirements are not clear. It is actually quite rare for requirements to be complete when someone is asked to undertake a project.

The companion challenge is that requirements change as the assignment moves forward. Usually this is called requirement creep because, almost always, the requirements expand to make the assignment more difficult and take more time. People are constantly learning. Some of that learning comes from issues uncovered during execution of the assignment.

The question becomes, “What to do about it?” The answer is pragmatic, “Get over it, and get on with it.” The risk becomes when will the requirements be clarified and what impact they have. Generally, this challenge arises repeatedly during the project. The response must be to reassess the project scope and risks, identify and evaluate any new risks posed by the changes, and then insist on a corresponding change in resources (i.e., funds, time, and perhaps personnel).

RELIANCE ON POOR INDICATORS OF RISK

There are three types of indicators: leading, concurrent, and lagging. Leading indicators identify events like risks that have not happened but are imminent or have become more unlikely. They are the best because they give you time to prepare for the event.

An example of a leading indicator was given earlier. Expecting printed material to be delivered by a certain date, you might anticipate the printing plates would be completed by a given earlier date. If the plates are not ready on time, you can forecast the probability the printed material will be delivered late has increased.

Another more common example is when you have budgeted a certain amount of money for some fabricated parts, but the quotes come in over budget. You have not yet spent the money, so the quotes are a leading indicator. You can request additional funds to cover the cost overruns, get more quotes in expectation of finding a lower price, or have the parts redesigned to make them less costly.

Concurrent indicators are those indicators that occur at the moment the risk materialized. For example, if you expect a delivery on a certain date, and the delivery either happens or not by that date, this would be a concurrent indicator.
Finally, there are lagging indicators. The most common lagging indicator is the financial statements from accounting. They are a historical picture. The information they present is about the past. Relying on lagging indicators is a poor way to manage affairs, especially risks. Even though accounting data is a lagging indicator does not diminish the value of financial statements. Identifying a situation from a lagging indicator and dealing with it is much better than lacking the data and having the impact grow.

**SCHEDULING ERRORS**

Scheduling errors are caused by people managing the activities. The most common error is to schedule only the best case. This almost guarantees the schedule cannot be met. People performing the work recognize the schedule is not realistic, and resort to their “reasonable effort” mode rather than their “best effort” mode of working.

Another scheduling error that occurs is to have ample time for all tasks. Again, people recognize they can finish the work in less time, or at least they believe they can, and they postpone the effort for as long as possible.

Having a scheduled time with no confidence limits, for example, a time estimate that excludes optimistic, realistic, and pessimistic estimates, makes risk management difficult. The tornado diagram becomes a vertical stick, and there is no indication as to which activities present the most significant risks.

Finally, the biggest scheduling error of all is not having a schedule. People who are doers, usually want to start accomplishing things without planning. That creates an absolute inability to manage risks or anything else related to the project.

**IGNORING THE HUMAN ASPECTS OF THE PROJECT/TASK/ASSIGNMENT**

When people are treated as if they were simply parts of a machine expected to perform a certain function, they respond by limiting their thinking about what they are doing and what else is going on around them. They cease to contribute outside the narrow confines of their explicit responsibility. People are not only the prime movers of knowledge-based work, but they are the eyes and ears of the operation. Given encouragement, proper respect, and trust, they will help identify risks, their indicators, and the current status of activities.
ONLY ASKING, “WHEN WILL IT BE DONE?”

Be aware that people do not want to be the source of bad news. Instinctively, they avoid giving you bad news, or tell you what you want to hear or, if they have an attitude, give you a worst-case. Instead, ask what they are working on, what has been completed, and, very importantly, what challenges have come up. Be prepared if a problem does come up, to ask what you could do for them to help get the problem resolved. But when you ask, be prepared if they identify (reasonable) resources that will help resolve the problem, you actually do work to get them those resources.

EXCLUDING TIME TO INCLUDE THE VOICE OF THE CUSTOMER

Although the customer is a stakeholder, they may not be actively involved in execution. Nevertheless, they are the final judge of success. If a project or assignment meets all the explicit requirements, but the customer is unsatisfied, then it is difficult to call the results a success. Also, the customer always has a unique view of the real requirements. A customer who is engaged as an active partner can suggest ways to modify the project scope and overcome risks that may not be apparent to the people doing the work.

IDENTIFYING RISKS AND TAKING NO ACTION ON THEM

If a risk is identified, it must be acted on if it comes to pass. This is true even for risks where the management approach is accept. Otherwise, even what would be a minor inconvenience can grow in impact until it is much costlier to correct.

NOT IDENTIFYING RISKS

On all but the most trivial activities, it is not realistic to identify every single risk at the outset. As the activity progresses, it is common for new risks to be uncovered. There are, then, really two aspects to not identifying risks. The first is to skip the step completely and plan to deal with adverse events when they occur. The second is to stop identifying and managing risks once the plan is put into action.

INSUFFICIENT RESOURCES

The project or activity should have sufficient resources available to not only support the plan but the additional resources to handle the net risk. If the resources are not sufficient to support plan plus net risk, then there is strong likelihood the plan cannot be completed.
COMPETING PRIORITIES OR INITIATIVES
Having adequate resources allocated or identified at the beginning of the activity is no guarantee they will remain available during execution. If resources, notably money and people, are reassigned, then even if the plan is supported, there may not remain enough resources to handle the net risk. Therefore, diminishing resources puts the entire project at risk.

CORPORATE CULTURE
Every organization has its own culture. Even groups within an organization have cultural differences from each other. Part of the culture is the organization’s attitude toward risk. Another part is their attitude toward cooperation. And still another part is their ability to maintain resources committed to an activity.

LACK OF EXECUTIVE SPONSORSHIP
Lack of executive sponsorship and active involvement (monitoring) is a major cause of a project losing resources or not being able to gain additional resources to overcome issues or take advantage of opportunities.

LACK OF PERCEIVED VALUE
Whether at the executive level or at the level where the activity takes place, if the people involved do not perceive the activity has value, its execution will not attract the best effort. This causes the activity to have disproportionately high number of negative risks with a disproportionately high probability of occurrence.

DIFFICULTY IN PROVING THE BUSINESS CASE
This translates directly into a lack of perceived value.
REFERENCES

“Identifying Risk Exposure: Questions for the Project Manager”; EnterpriseCM, Inc.; www.enterprisecm.com

Based on “Fundamentals of Risk Management”; EnterpriseCM, Inc.; www.enterprisecm.com


Hall, Dave & Hulett, Dr. David; “Universal Risk Project – Final Report”; INCOSE Risk Management Working Group; UK Association for Project Management

Chadboure, Bruce C.; “To the Heart of Risk Management: Teaching Project Teams to Combat Risk”; Proceedings of the 30th Annual Project Management Institute 1999 Seminars & Symposium

“On Being Proactive”; www.newproductdynamics.com/newsletters02.htm


“Top 10 Sources of Project Failure”; www.focusedperformance.com/toptenpm.html

“Critical Chain Scheduling and Buffer Management ... Getting Out from Between Parkinson’s Rock and Murphy’s Hard Place”; PM Network; April, 1999; www.focusedperformance.com/articles/ccpm.html

Tod, Mary & Duffy, Jan; “Risk, Risk and More Risk Surrounds Large IT Projects”; www2.cio.com/analyst/report1661.html


Turbit, Neville; “Basics of Managing Risk”; The Project Perfect white paper collection; www.projectperfect.com.au
Turbit, Neville; “Managing Assumptions”; The Project Perfect white paper collection; www.projectperfect.com.au

Wiefling, Kimberly; “Scrappy Project Management – The 12 Predictable and Avoidable Pitfalls Every Project Faces”; Wiefling Consulting

Butler, Debra; “What IS Risk Management”; You’ LLC

Bombosch, Tim; “Kick Your Project Management Skills Up a Notch – Risk Management Fundamentals”