Managing Project Risk

Project Skills

Paul Newton

Table of Contents

Preface

Every project involves risks and every project needs to have a management strategy for dealing with the threats and opportunities represented by each risk. This eBook explains the key issues and concepts involved in effective risk management in a clear and accessible way, providing a comprehensive approach that is applicable to all sizes of project, whether requiring detailed, quantitative analysis or a rougher approach using only qualitative analysis.

You will learn:

- Why a proactive approach to risk management is necessary.
- How to develop a risk management plan that will protect the project.
- How to identify and document risks.
- How to prioritize risks by assessing their probability and impact.
- How to assess risks using both qualitative and quantitative approaches.

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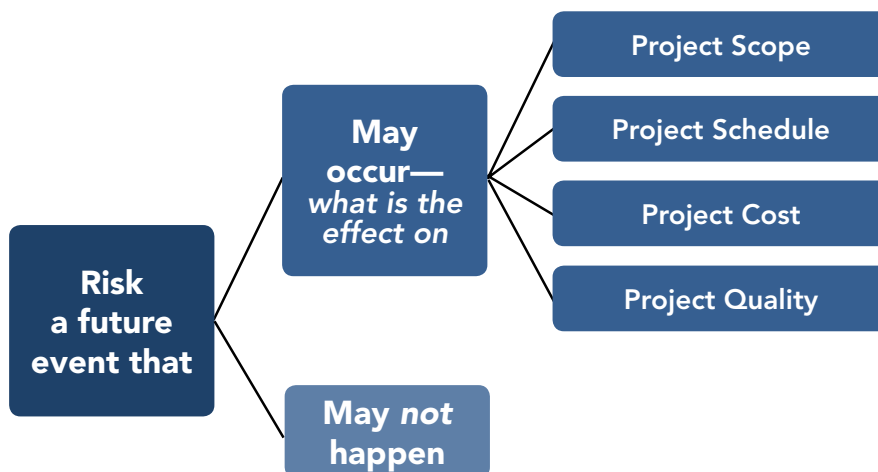
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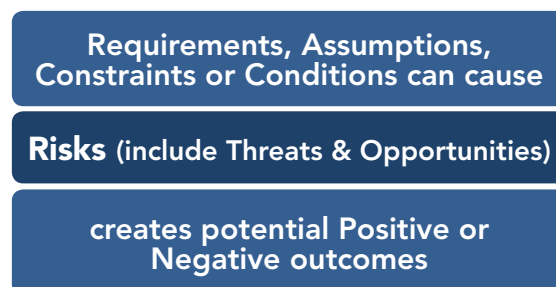
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Introduction

Everything that is done in business contains some measure of risk. No matter what the activity, there is an element of risk that must be analyzed and weighed against the potential rewards. The best organizations are those who can choose the right risks to take on, and the ones to avoid.

Dealing with too little risk often means that the organization is being too conservative and is limiting their potential for growth—too much risk, however, and the company is likely to crash and burn at some point along the way.

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                                          │    Project Scope     │
                                          └──────────────────────┘
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                        │     May      │  │   Project Schedule   │
                        │   occur—     │  └──────────────────────┘
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As projects are a regular part of business, it only stands to reason that they incur a certain level of risk as well. Managing project risk deals with the activities involved in **identifying potential risks**, assessing and analyzing them, finally monitoring them throughout the life of a project. Every project will have a unique set of risks based on the specific details of the work being done. It is often up to the project manager to outline these risks ahead of time and include them as part of the overall plan of the project.

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┌──────────────────────────────────────────────┐
│       Requirements, Assumptions,              │
│    Constraints or Conditions can cause        │
├──────────────────────────────────────────────┤
│  Risks (include Threats & Opportunities)      │
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│       creates potential Positive or           │
│            Negative outcomes                  │
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Dealing with the risk inside of a project isn't much different from dealing with any other business risks that you encounter. While it probably isn't possible to foresee all potential risks that could come down the line, planning for as many of them as you can will give the project its greatest chance at success.

Identifying the Risks

Before a project even gets started, it is essential that any potential risks are identified and a strategy for managing such risks developed. One of the best ways to do this is by learning from past experience—either your own experiences, or those of the organization as a whole.

Even if the type of project you are working on presently is different than anything you have done before, it is likely the organization has already done something at least remotely similar. Look back on those projects to see how they played out. Did anything pop up along the way that you could be ready for this time? Learning from the past is the best way to predict the future, especially in business.

Another risk identification strategy to use is speaking with all of the members of the project team and asking for their input. Although they might not have the same high-level view of the project that you do as manager, they likely have a great deal of knowledge within their specific field of expertise. Ask them to highlight the potential risks that they see developing down the line and work on making plans for those possibilities as well. There is only one output of this process and that is the all important **risk register**, which plays a key role in how well a project is monitoring during its execution.

Risk Register	List of ALL Risks
• may be used to update Risk Breakdown Structure (RBS)	• their root cause • category • & responses

Among the most common risks that need to be dealt with are losing key members of the team partway through the project, or running out of money to see the project all the way through to completion. In the case of both of those risks, there are steps that can be taken to mitigate the damage they would do and be prepared in the event that they do occur.

For example, having redundancy within your team can help to limit the damage if a team member moves on to another job partway through the work, and building the project in such a way that it can be 'paused' while waiting for more funds could prevent it from being completely wiped out by a temporary lack of funding.

Evaluating the Risks

With a list in place that highlights which risks you will be taking on during the project, you can start looking closely at each of them and deciding what kind of threat they actually are. Is the risk something that would do long-term damage to the organization if it came to pass? Usually, risks that fall into this category are of the legal variety.

A project that could put you in legal trouble for one reason or another is often one to be avoided. However, if the worst-case for a project is simply some wasted time and a small amount of wasted capital, you may decide that those risks are worth the potential reward. It is all about balance in risk management, so the pros and cons have to be weighed carefully with respect to each potential risk.

Both qualitative and quantitative analysis must be performed for each risk. Firstly, each risk is assessed and rated according to its likely probability and then secondly on the impact it would have on the project if it happened. There are a variety of tools that are used to assist in these processes:

Techniques used in Risk Analysis	
Qualitative	**Quantitative**
Risk Probability & Impact Assessment Probability & Impact Matrix Risk Data Quality Assessment Risk Categorization Risk Urgency Assessment Expert Judgment	Data Gathering & Representation Techniques Quantitative Risk Analysis & Modeling Techniques: • *Sensitivity Analysis* • *Expected Monetary Value (EVM) Analysis* • *Decision Tree Analysis* • *Tornado Diagrams* • *Monte Carlo Analysis* Expert Judgment

Qualitative Risk Analysis

○ Risk Probability & Impact Assessment

○ Probability & Impact Matrix

○ Risk Data Quality Assessment

○ Risk Categorization

○ Risk Urgency Assessment

○ Expert Judgment

Quantitative Risk Analysis

○ Sensitivity Analysis

○ Expected Monetary Value (EMV) Analysis

○ Decision Tree Analysis

○ Tornado Diagrams

○ Monte Carlo Analysis

Beyond what kind of damage a certain risk could do is the consideration of how likely that risk is to occur. For example, a risk that is very likely to occur and would also be highly damaging to the company is one to take very seriously. On the other hand, a risk that is unlikely to be realized and also wouldn't do much harm is one that you can mostly ignore.
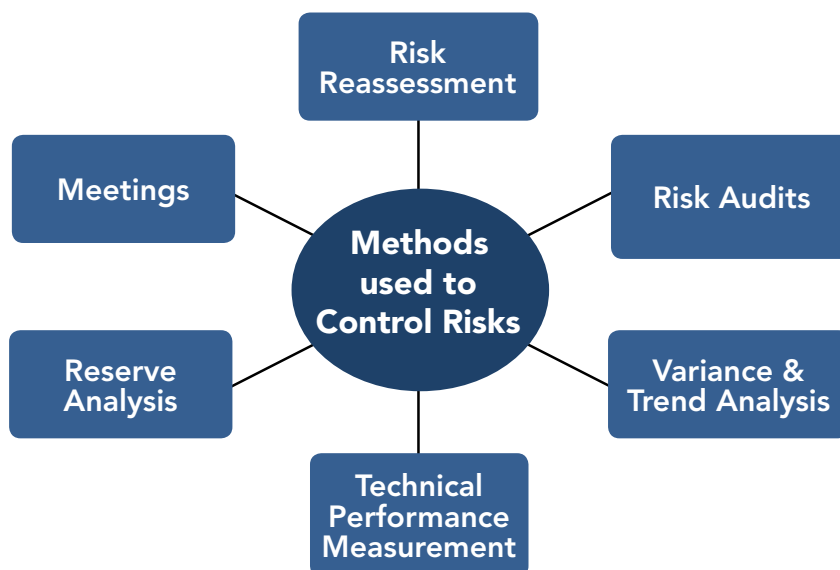
Mitigating the Risks

This was touched on briefly above as far as taking steps to limit the damage that any of your potential risks would do. The easiest example to understand is the one regarding members of the team.

When you are building a team to work on the project, keep in mind that not every team member will see the project through from start to finish. If you only have one person who is capable of performing a vital portion of the work, you are exposed to risk if that person should leave for any reason. Instead, there should be as much redundancy as possible—especially in the critical areas of the project—so the loss of one or two people along the way doesn't derail the entire project.

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┌─────────────────────────────────────┐
│  Strategies for Dealing with Project │
│          Risk Responses              │
└─────────────────────────────────────┘
        │           │           │
┌───────────┐ ┌───────────┐ ┌───────────┐
│ Negative  │ │ Positive  │ │Contingent │
│ Risks or  │ │ Risks or  │ │ Response  │
│ Threats   │ │Opportunities│ │         │
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Doing what you can to limit your exposure to risk throughout the project, while still giving the project a chance to succeed is the task that a project manager takes on. No one likes to have to deal with risk, but it is an unavoidable part of doing business.

The best that can be done is to evaluate each risk that you might face, and weigh it against the potential rewards that are waiting at the end of the project. Project managers also plan how they will control risks using a variety of tools and techniques shown in the diagram below.

```
                    Risk
                Reassessment
                     │
  Meetings           │         Risk Audits
      \              │              /
       \        Methods          /
        \       used to         /
        ─────  Control Risks  ─────
        /                       \
       /                         \
 Reserve                    Variance &
 Analysis                   Trend Analysis
                │
           Technical
          Performance
          Measurement
```

The goal is to make the level of risk acceptable to the organization and to take steps that minimize the element of risk as much as possible.

Managing Project Risk

A risk is a future event that may or may not happen, but if it does occur it will have an effect on project **scope**, **schedule**, **budget**, or **quality**. It may have one or more causes and, if it occurs, it may have one or more impacts.

All project activities carry some element of risk, which are uncertainties about them that could affect the project for better or worse. It is important to understand the difference between business risks and project risks. What a project manager needs to know is what is the likelihood a risk will occur and if it does what will it impact as this affects the **project plan**.
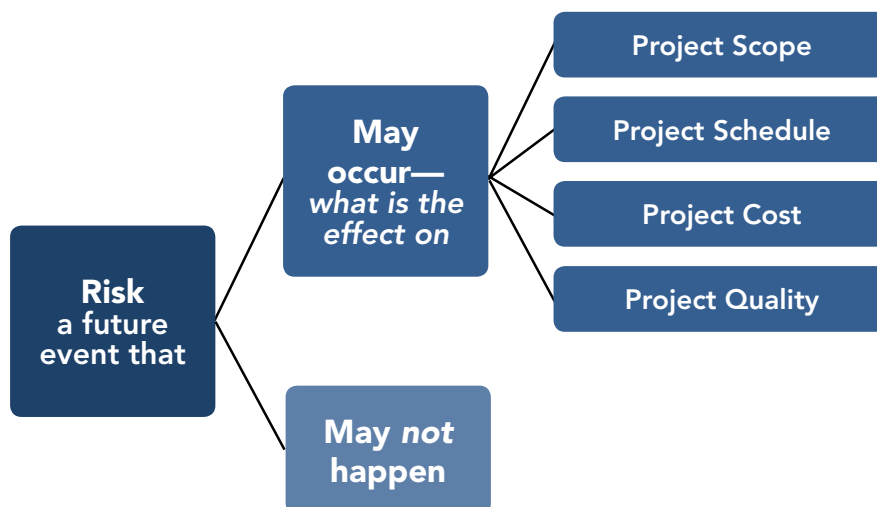
What is certain is that if the risk happens in the future it will have an effect on project project scope, schedule, cost, or quality. It may have one or more causes and, if it occurs, it may have one or more impacts. All project activities carry some element of risk, which are uncertainties about them that could affect the project for better or worse.

The important distinction that must be understood is the difference between business risks and project risks. Business risks are more general and relate to the organization, whereas project risks relate specifically to the project objectives.

Business risk implies uncertainty in profits or danger of loss and the events that could pose a risk due to some unforeseen events in future, which causes business to fail. (Wikipedia)

For example,

- Project scope—to build the stadium to the agreed specification within an agreed timescale and budget.

- Project risk—that the building costs may be higher than expected because of an increase in materials or labor costs.

- Business risk—even if the stadium is constructed on time and within budget that it will not make money for the business.

This could be because of lower than expected ticket sales or higher than expected maintenance costs. These risks exist outside of the scope of the project. Risks are caused by a requirement, assumption, constraint, or condition that creates the possibility of negative or positive outcomes.
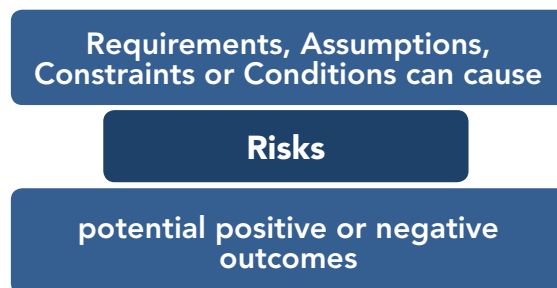
Continuing the example above: a risk cause would be a change in health and safety legislation during the build phase. Whereas a risk outcome would be increased costs to modify the parts of the stadium in accordance with the new legislation before it can be used.

Project Impact on cost, schedule and performance needs to assessed:

1. Shortage of skilled personnel due to demand by other building projects.
2. Unexpected cost of inspection & license.
3. The build of the affected parts of the stadium can be brought forward to finish project on time.

Risks include both threats and opportunities that project managers must assess. Opportunities do have uncertainty associated with them, but they should be grasped, and action taken to ensure that they are realized.

Threats have potentially negative impacts that the project management team should strive to mitigate. Organizations and stakeholders are willing to accept varying degrees of risk. This is called risk tolerance. Risks that are threats to the project may be accepted if they are in balance with the rewards that may be gained from taking them.

For example, using unproven productivity-boosting software is a risk taken in the expectation that the work will be completed more quickly and with fewer resources. The risk of the software not performing as advertised would need to be considered as part of the risk assessment.

All organizations have a 'risk tolerance' that is affected by their legal status and their culture. For instance, a pension fund is likely to be more risk averse than a small start up company. In all cases, attitudes to risk are driven by perception, tolerances, and other biases, which should be made explicit wherever possible.

Risk Tolerance	Balance of: Risk vs Reward	Affected by: • Organizational Culture • Legal Status • Perceptions • Attitudes & Biases

To be successful, the organization should be committed to address risk management proactively and consistently throughout the project. A conscious choice must be made at all levels to actively identify and pursue effective risk management during the life of the project. Communication about risk and it's handling should be open and honest.

Risk exists the moment a project is conceived. Moving forward on a project without a proactive focus on risk management increases the impact that a realized risk can have on the project and can potentially lead to project failure.

KEY POINTS

- ✔ A risk is a future event that may or may not happen but if it does occur it will have an effect on project scope, schedule, cost, or quality.

- ✔ Risks include both threats and opportunities because both have uncertainty associated with them.

- ✔ A project manager needs to know the likelihood that a risk will occur and its potential impact to the project if it does.

- ✔ All organizations have a 'risk tolerance' that is affected by their legal status and their culture.

- ✔ Attitudes to risk are driven by perception, tolerances, and other biases, which should be made explicit wherever possible.

Creating a Risk Management Plan

A risk plan details how the project management team will perform risk management for this project. It does not involve actually identifying project risk. The aim of the risk plan is to ensure that the risk management protocol that is used on the project is commensurate with both the risks and the importance of the project to the organization.

Establishing this protocol early on in the project ensures that all members of the project management team are using the same methods to evaluate risks and that the associated tasks are budgeted for in the **project plan**. You can check out the complete range of **Project Management PDF** eBooks free from our website.

The level of detail in the **risk plan** will depend upon the level of risk within the project and the level of risk that the performing organization is prepared to take. This plan will need to be consistent with other certain other project documents.

For example, the **project charter** document provides the selected project manager with the authority to organize and control the defined resources of the organization for the duration of the project. It can also be referred to as the project definition, or project statement and is a statement of the scope, objectives, and participants in a project.

It establishes the authority assigned to the project manager, especially in a matrix management environment, and is completed by the sponsor or individual initiating the project. The project name is usually shortened or abbreviated into a working title for ease of communication. There are several key sections that you need to include in your project charter. They are:

1. Contact points for key individuals of the project.

2. Project Purpose—the issue/problem to be solved by the project.

3. Business Objectives for the project as they relate to the organizations strategic plan.

4. Assumptions that have been made as part of the project.

5. Description of the project.

6. Definition of the project scope and the limits identified.

7. Overview of major milestones and deliverables for the project.

8. Project Authority—including an organization chart and definition of roles and responsibilities.

9. Resources required for the project including costings, equipment. staffing, support, operational & IT facilities.

The scope statement defines the scope of the project, which will have a direct bearing on the type and amount of risk that is likely to be encountered. It provides a clear definition of such risk areas.

> The **cost plan** defines how risk in terms of budgets, contingencies, and management reserves will be reported and accessed.

> The **schedule plan** includes information about activities and their timing including aspects such as internal and external constraints that will help identify risk areas.

> The **communications plan** includes information on all key stakeholders and in particular their concerns for specific risks, and hence, how such communications should be handled.

You will also need to take account of any legal obligations and regulatory frameworks that the organization may be subjected to as well as processes and procedures to be followed, the industry and its norms towards risk and the organizations appetite towards risk.

Collective decision-making is very important area of project management that can make or break this part of the project. Almost all risk management activities will involve meetings between the project manager, the team and other stakeholders in order to make decisions about the activity definitions and associated estimates.

How well these meetings are conducted will have a major impact on how smoothly the project runs. To learn more about making your meetings effective download the free **Meeting Skills** eBooks, checklists and templates cover all aspects of meetings including how to set an agenda that will ensure that the meeting achieves it's aims and how to chair a meeting so that it is as productive as possible.

The resulting **risk management plan** forms part of the **project plan** and describes how managing risk will be structured and performed on the project. It contains the following elements:

Methodology
Defines the approaches, tools, and data sources that may be used.

Roles and Responsibilities
This part of the plan needs to make clear who is responsible for each type of activity in the risk plan, and clarifies their responsibilities.

Budgeting

This part of the plan assigns resources, estimates funds needed for managing risk. These are included in the cost performance baseline, and establish how any extra funding required (if risks are realized) will be raised.

Timing

This part of the plan defines when and how often the risk management activities will be performed throughout the project life cycle.
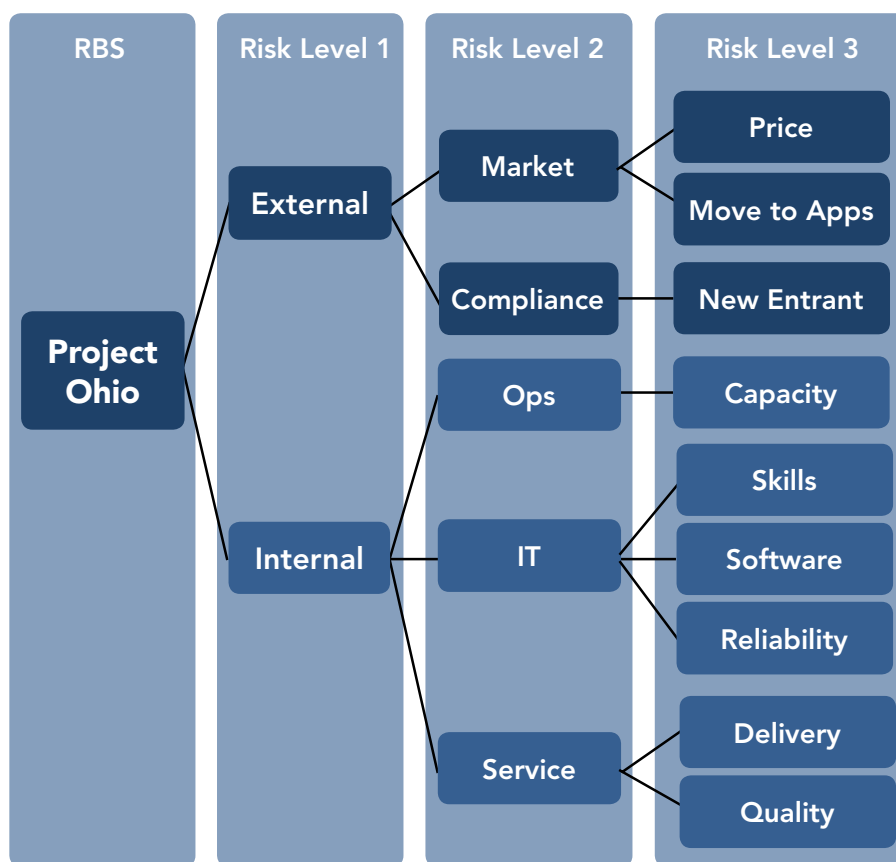
Risk categories

This provides a structure that ensures a comprehensive process of systematically identifying risks to a consistent level of detail. An organization can use a previously prepared categorization framework, which might take the form of a simple list of categories or might be structured into a **risk breakdown structure** (RBS) as shown in the diagram.

This is a hierarchically organized depiction of the identified project risks arranged by risk category and subcategory that identifies the various areas and causes of potential risks.

Definitions of Risk Probability and Impact
This ensures that all stakeholders have a common understanding of these definitions. For example,

If the probability of a risk can be described as low, medium or high, what do these categories actually mean?

Similarly, what effect would a high impact event have on the project in practical terms?

How much would it add to the costs?

Could anything be done to mitigate it? Risk Impact Scales for Project Ohio—Major Objectives						
Major Objective	**<5%**	**10%**	**20%**	**40%**	**60%**	**85%**
Scope	Minimal	Minor areas	Major areas	Unacceptable to Sponsor	Project abandoned	
Quality	Very Minor	Minimal	Specific	Need OK of Sponsor	Sponsor Reject	Project ended
Time	None	Trivial	<8% rise	15% rise	25% rise	>30%
Cost	<1%	< 8%	15-20%	40-50%	55-65%	>70%

The table above is an example of definitions that could be used in evaluating risk impacts related to scope, quality, time and cost. By using pre-defined definitions in this way, the project management team ensures that everyone involved is talking the same language when it comes to risk.

Probability and Impact Matrix

Risks are prioritized according to their potential implications for having an effect on the project's objectives by using a matrix like the one shown.

Impact Probability	Negligible-1	Minor-2	Moderate-3	Significant-4	Severe-5
>81%	Low Risk	Moderate Risk	High Risk	Extreme Risk	Extreme Risk
61-80%	Minimal Risk	Low Risk	Moderate Risk	High Risk	Extreme Risk
41-60%	Minimal Risk	Low Risk	Moderate Risk	High Risk	High Risk
21-40%	Minimal Risk	Low Risk	Low Risk	Moderate Risk	High Risk
<20%	Minimal Risk	Minimal Risk	Low Risk	Moderate Risk	High Risk

The specific combinations of probability and impact that lead to a risk being rated as 'extreme', 'high,' 'moderate,' 'low' or 'minimal' importance, with the corresponding importance for planning responses to the risk, are usually set by the organization.

Revised Stakeholder Risk Tolerances

If there is a need to revise **stakeholder** risk tolerances then these should be documented.

Reporting Formats

This part of the plan describes how the outcomes of the risk management processes will be documented, analyzed, and communicated. It describes the content and format of the **risk register** as well as any other risk reports required.

Tracking

This part of the plan describes how risk activities will be recorded for the benefit of the current project, as well as for future needs and lessons learned, as well as whether and how risk management processes will be audited.

✔ A risk plan details how the project management team will perform the tasks associated with managing risk for this project. It does not involve actually identifying project risks.

✔ Establishing this protocol early on in the project ensures that all members of the project management team are using the same methods to evaluate risks and that the risk management tasks are budgeted for.

Identifying Project Risks

Project risks should be documented in the **risk register**, a list of all of the identified risks, their root causes, categories and responses. Because the assessment of risk is an ongoing activity, the risk register will be updated continuously throughout the life of the project.
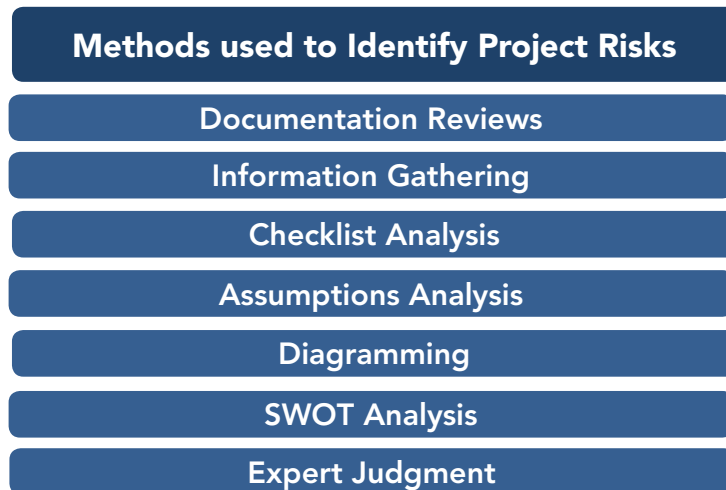
All project team members should be encouraged to identify risks and this is an iterative process because new risks may become known as the project progresses. The process of identification should involve the project team so they can develop and maintain a sense of ownership and responsibility for the risks and associated risk response actions.

The **risk plan** defines the level of risk that is considered tolerable for the project, how all this will be managed, who will be responsible for them, what time and cost is needed for each, and how risk will be communicated. The **stakeholder register** lists all of the project stakeholders as well as describing and classifying them. This information will be useful in soliciting inputs for identifying risk, as it will ensure that key stakeholders participate in the process.

Other elements of the overall project plan that describe how cost, schedule and quality are to be managed and implemented will have a bearing on project risk, as will information on how project human resources are going to be defined, staffed, managed, and eventually released. The **scope of the project** in terms of the products to be created and the activities required will be a source of risks.

Any estimates of cost and duration are useful in identifying risk as they provide a quantitative assessment of the likely cost to complete scheduled activities. Reviewing

these may indicate that the estimate is insufficient to complete the activity and hence poses a risk to the project. These include, **assumptions log**, work performance reports, earned value reports,network diagrams, baselines, and other project information proven to be valuable in identifying risks.

Methods used to Identify Project Risks
Documentation Reviews
Information Gathering
Checklist Analysis
Assumptions Analysis
Diagramming
SWOT Analysis
Expert Judgment

If the project requires buying-in of resources, procurement documents become a key input to this process. The complexity and the level of detail of such documents should be consistent with the value of, and risks associated with, **planned procurement.**

Laws and regulations governing the creation or use of the projects products need to be taken into account along with the operational environment within which the project is taking place. The views of the project stakeholders and their willingness to accept risk must also be taken into consideration.

Risks can be identified directly by experts with relevant experience of similar projects or business areas. These should be identified by the project manager and invited to consider all aspects of the project and suggest possible risks based on their previous experience and areas of expertise, and there are several techniques that can also be used to identify project risk.

Documentation Reviews

These are structured reviews of all project documentation up to this point in time including plans, assumptions, previous project files, contracts, and other information. The quality of the plans, as well as consistency between those

plans and the project requirements and assumptions, can be indicators of risk in the project. Missing, inaccurate or incomplete information may hinder the identification of risks and may itself be a source of risk. You can also use the **risk breakdown structure** developed either from this project or from a previous project to help ensure that all significant risks or categories have been identified.

Assumptions Analysis

Every identified project risk is based on a set of hypotheses, scenarios, or assumptions. **Assumptions analysis** explores the validity of assumptions as they apply to the project. It identifies risks to the project from the inaccuracy, inconsistency or incompleteness of assumptions.

Fishbone Diagrams

Risk diagramming techniques include cause and effect diagrams, also known as Ishikawa or fishbone diagrams, and are useful for identifying causes of risks.

Flow charts can also be used to show how various elements of a system interrelate, and the mechanism of causation, as can influence diagrams, which show causal influences, time ordering of events, and other relationships among variables and outcomes.

SWOT Analysis

This technique looks at the project from the perspective of its internal strengths and weaknesses as well as external opportunities, and threats. SWOT analysis is a useful approach to risk assessment and you can learn more about this technique from our free **SWOT Analysis eBook**.

Identified risks should be documented in a **risk register** that consists of the list of all the identified risks, their root causes, categories and responses. This information may be used to update the risk breakdown structure.

Because of risk is an ongoing activity, the risk register will be updated continuously throughout the life of the project and it is a key tool to aid in the management of risks within a project. The risk register ultimately contains the outcomes of the other risk management processes as they are conducted, resulting in an increase in the level and type of information contained in the risk register over time.

KEY POINTS

✔ The risk register is a list of all of the identified risks, their root causes, categories and responses.

✔ All project team members should be encouraged to identify risks and this is an iterative process because new risks may become known as the project progresses.

✔ Risks can be identified directly by stakeholders with relevant experience of similar projects or business areas.

✔ There are several tools and techniques that can be used to identify project risk including: fishbone diagrams, documentation reviews and SWOT analysis.

Performing a Risk Analysis

This process analyses each risk from the **risk register** in terms of its probability and impact on the project if it were to occur. It should be performed as soon as possible after risks have been identified so that appropriate time and resources can be allocated to the more serious risks. It uses the probability and impact matrix (PIM) to rank and prioritize risks, and this information is placed back on the risk register.

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┌─────────────────────────────┐      ┌─────────────────┐
│   Plan Elements for         │ ───▶ │   Roles &       │
│   Managing Project Risk     │      │   Responsibilities │
└─────────────────────────────┘      └─────────────────┘

┌─────────────────┐   ┌─────────────────┐   ┌─────────────────┐
│                 │   │   Risk Mgmt     │   │                 │
│    Budget       │──▶│   Activity      │──▶│  Definition Risk│
│                 │   │   Schedule      │   │   Categories    │
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│  Definition of  │   │   Probability & │   │   Stakeholder   │
│  Probability &  │──▶│   Impact Matrix │──▶│   Risk Tolerances│
│  Impact         │   │                 │   │                 │
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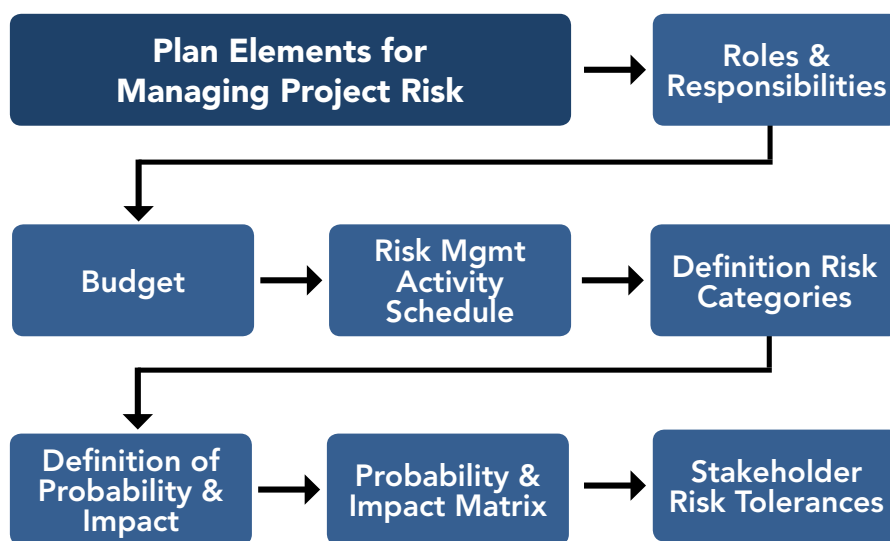
Like all the processes and procedures for managing risk, this one should be performed regularly because new risks will be identified and the characteristics of existing risks may change as the project progresses. The **risk management plan** (part of the overall **project plan**) will explain the overall approach that needs to be taken to risk management on this particular project. It will detail how much risk is acceptable and who should be involved in carrying out the qualitative analysis of the known risks.

The key elements of this plan used in this process are roles and responsibilities for conducting risk management, budget, schedule for risk management activities, definition of risk categories, definition of risk probability and impact, probability and impact matrix, and stakeholder's risk tolerances.

The scope of the project will have a direct bearing on the type and amount of risk that is likely to be encountered. In general terms, certain types of project are associated with certain types of risk. For example,

Construction projects the risks would include such things like, planning permissions, weather, health and safety legislation, and labor union issues.

IT project risks tend to be concerned with whether development software will perform as advertised and with compatibility issues.

Projects of a common or recurrent type tend to have well understood risks, whereas those breaking new ground tend to have more uncertainty.

Perform Qualitative Risk Analysis Techniques

• Risk Probability & Impact Assessment
• Probability & Impact Matrix
• Risk Data Quality Assessment
• Risk Categorization
• Risk Urgency Assessment
• Expert Judgment

There are various techniques that can be used to identify risks.

Risk Probability and Impact Assessment

Risk probability assessment investigates the likelihood that each specific risk will occur, whereas risk impact assessment investigates the potential effect on a project objective such as schedule, budget, quality, or performance.

Both the likelihood and impact are given a score according to the definitions given in the risk plan and these can be considered together to provide a risk score. Risks with a high score will be given high priority while those with a low score will be included on a watch list for future monitoring.

Probability and Impact Matrix

Evaluation of each risk's importance and, hence, priority for attention can be done using a probability and impact matrix as shown.

Probability & Impact Matrix								
Probability	**Threats**				**Opportunities**			
0.90	0.05	0.18	0.54	0.72	0.72	0.54	0.18	0.05
0.75	0.04	0.15	0.45	0.60	0.60	0.45	0.15	0.04
0.50	0.03	0.10	0.30	0.40	0.40	0.30	0.10	0.03
0.25	0.01	0.05	0.15	0.20	0.20	0.15	0.05	0.01
0.10	0.01	0.02	0.06	0.08	0.08	0.06	0.02	0.01
Impact	0.05	0.20	0.60	0.80	0.80	0.60	0.20	0.05

This specifies combinations of probability and impact that lead to rating the risks as low, moderate, or high priority. The type of management response should be:

1) Threats
   ○ *High-risk* (shown in dark gray boxes) are priority and need a hard line response.
   ○ *Low-risk* (mid-gray boxes) need to have a contingency made for them & monitored

2) Opportunities
   ○ *Dark gray boxes* show ones to pursue first as they offer the most benefit & are more easily achieved.
   ○ *Mid-gray boxes* indicate the ones to be monitored.

It is possible to rate a risk separately for cost, time, scope and quality. In addition, it can develop ways to determine one overall rating for each risk. An overall rating scheme can be developed to reflect the organization's preference for one objective over another and using those preferences to develop a weighting of the risks that are assessed by objective.

You will also need to examine how well the risk is understood and the accuracy, quality, reliability, and integrity of the data regarding it. If data quality is unacceptable, it may be necessary to gather higher-quality data. The risk breakdown structure (RBS) is the normal way to help structure and organize all identified risks into appropriate categories, and these will assist in determining which aspects of the project have the highest degree of uncertainty.

Risks that are likely to occur in the immediate future require more urgent attention than those that may occur later on in the project. Indicators of priority should include the time required to affect a risk response. In some qualitative analyses the assessment of risk urgency can be combined with the risk ranking determined from the probability and impact matrix to give a final risk severity rating.

Revisions to Project Documents	occurs after	Qualitative Risk Analysis is complete
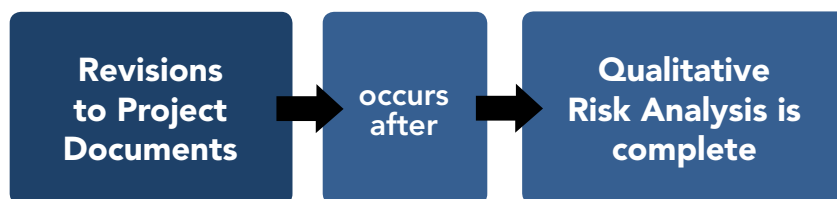
The **risk register** can be updated with the following information.

Relative ranking or priority list of project risks—the probability and impact matrix can be used to classify risks according to their individual significance. Risks may be listed by priority separately for schedule, cost, and performance since organizations may value one objective over another. The project manager can then use the prioritized list of risks to focus attention on those items of high significance to the most important objectives.

Risks grouped by categories—this can point to common underlying causes of risk, which may in turn suggest a holistic approach to dealing with them. Discovering concentrations of risk may also improve the effectiveness of risk responses.

List of risks requiring response in the near-term—includes those risks that require an urgent response and those that can be handled at a later date may be put into different groups.

List of risks for additional analysis and response—some risks might warrant more analysis, including Quantitative Risk Analysis, as well as response action.
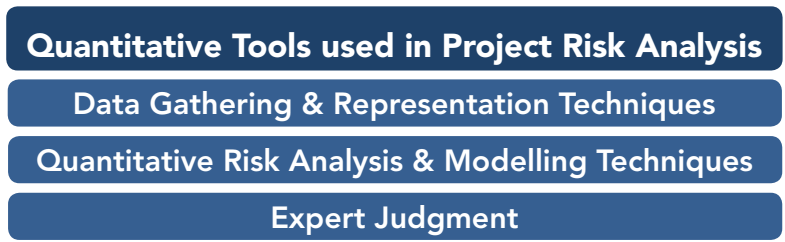
Watch lists of low-priority risks—those that are not assessed as important in this process can be placed on a watch list for continued monitoring.

Trends in the analysis results—as this process is iterative, trends for particular types of risk may become apparent. This information can be fed back into the risk management process.

Assumptions log—the project scope statement may contain assumptions about the project, which may be updated as a result of the qualitative risk analysis done in this process.

This is the process of analyzing the effect of those risks identified as having the potential to substantially impact the project. It may be used to assign a numerical rating to those risks individually or to evaluate their aggregate effect. You will need to use the Risk Management Plan (part of the overall Project Plan) and the Risk Register, along with cost and schedule information. You can check out the complete range of **Project Management** eBooks free from our website.

In some projects it may be possible to develop effective risk responses without this process. The availability of time and budget, and the need for qualitative or quantitative statements about risk and impacts, will determine which method(s) to use.

Quantitative Tools used in Project Risk Analysis
Data Gathering & Representation Techniques
Quantitative Risk Analysis & Modelling Techniques
Expert Judgment

Structured interviews can be used to determine the probability and impact of risks from subject matter experts. This information can then be used in the following modelling techniques:

Sensitivity Analysis—this involves analyzing the project to determine how sensitive is to particular risks by analyzing the impact and severity of each risk.

Expected Monetary Value (EMV) Analysis—determining the expected monetary value is to multiply the likelihood by the cost impact to obtain an expected value for each risk, these are then added up to obtain the expected monetary value for the project. A typical way of calculating EMV is using decision trees:

Decision Tree Analysis—these are in the form of a flow diagram where each node, represented by a rectangle, contains a description of the risk aspect and its cost. These rectangles are linked together via arrows each arrow leading to another box representing the percentage probability.
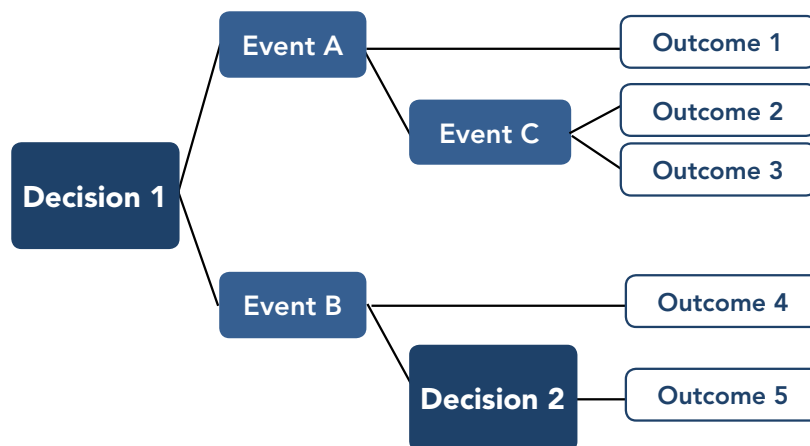
Tornado Diagrams—these are named because of their funnel shaped and portray graphically the project sensitivity to cost or other factors. Each tornado diagram will represent the impact of risks in terms of particular aspects. These aspects may be the stages of phases of all project, and are ranked vertically and represented by a horizontal bar showing plus or minus cost impacts.
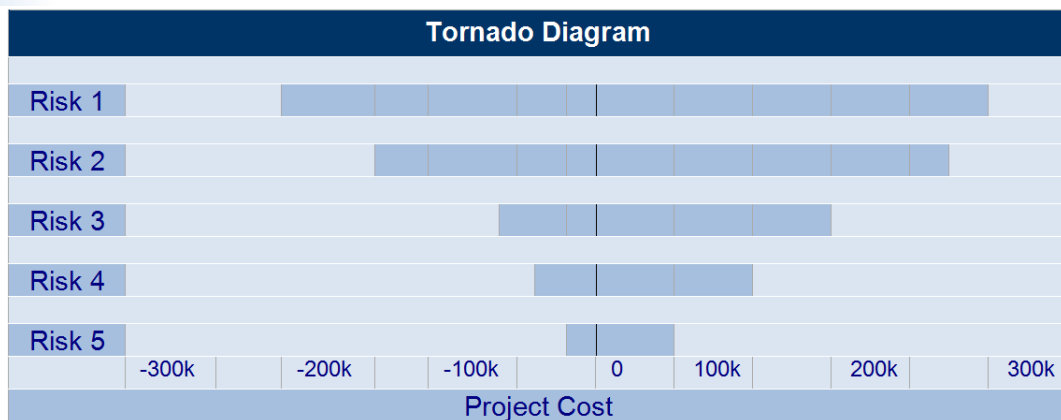
Monte Carlo Analysis—is normally calculated by computer by analyzing many scenarios for the project schedule and calculating the impact of particular the risk events. It is helpful in identifying risks and the effect they have on the project schedule.

Rather than ask each expert for a single value for each, the project manager would normally encourage each expert to provide an optimistic, pessimistic and realistic probability and impact value for each risk.

The risk register is further updated to include a quantitative risk report detailing quantitative approaches, outputs, and recommendations. Updates include the following:

Probabilistic Analysis of the Project—Estimates are made of potential project schedule and cost outcomes listing the possible completion dates and costs with their associated confidence levels. This output, often expressed as a cumulative distribution, can be used with stakeholder risk tolerances to permit quantification of the cost and time contingency reserves.

Probability of Achieving Cost and Time Objectives—With the risks facing the project, the probability of achieving project objectives under the current plan can be estimated using quantitative risk analysis results.

Prioritized List of Quantified Risks—This list of risks includes those that pose the greatest threat or present the greatest opportunity to the project. These include the risks that may have the greatest effect on cost contingency and those that are most likely to influence the critical path. These risks may be identified, in some cases, through a tornado diagram generated as a result of the simulation analyses.

Trends in the analysis results. As this process is iterative, trends for particular types of risk may become apparent. This information can be fed back into the risk management process.

KEY POINTS

✔ Risk analysis uses the probability and impact matrix (PIM) to rank and prioritize risks, and this information is placed back on the risk register.

✔ It should be performed as soon as possible after risks have been identified so that appropriate time and resources can be allocated to the more serious risks.

✔ Projects of a common or recurrent type tend to have well understood risks, whereas those breaking new ground tend to have more uncertainty.

✔ There are various techniques that can be used to identify risks including a probability and impact matrix.

✔ The probability and impact matrix can be used to classify risks according to their individual significance. This prioritized list of risks can be used to focus attention on those items of high significance to the most important objectives.

✔ Risks can also be grouped by categories that can point to common underlying causes of risk, which may in turn suggest a holistic approach to dealing with them.

✔ Identified risks can then be quantified using expected monetary value analysis, decision tree analysis, tornado diagrams, and Monte Carlo analysis.

Planning & Controlling Risk Responses

It is important that planned responses are appropriate to the significance of the risk, cost effective in meeting the challenge, realistic within the project context, agreed upon by all parties involved, and owned by a responsible person. The individual owner of each risk will need to communicate with the appropriate stakeholders who may be impacted by it's occurrence as part of managing the risk.

Risk Management Plan & Risk Register → Form Basis of Planning Response to Project Risks

The **risk plan** defines the level of risk which is seen as acceptable, how risks will be managed, who will be responsible for carrying out risk related activities, the time and cost of each risk activity and how the communication of risk is to occur. You will need to use this along with the risk register to plan your responses. See the **risk register template**.

Strategies for Dealing with Project Risk Responses

Negative Risks or Threats · Positive Risks or Opportunities · Contingent Response

There are four possible strategies for dealing with threats or risks that may have negative impacts on the project.

1. **Avoid**—This involves taking action to either reduce the probability of the risk and/or its impact to zero. In either case this response enables the risk to be circumvented entirely. For example, using a certain supplier might carry the risk of them going out of business during the course of the project. This risk could be avoided by using a supplier who was bigger, better established and more financially secure.

2. **Transfer**—This involves transferring the risk to a third party so that they are responsible for its management and impact. It does not eliminate the risk it simply transfers the liability to someone else. This can be done by:

    ○ Taking out insurance (the insurance company is now liable) or

    ○ Having the work done under a fixed-price contract (the contractor is now liable). Risk transference nearly always involves payment of a risk premium to the party taking on the risk and may introduce new risks. For example, an insurance company may contest the claim or a contractor might dispute the terms and conditions of the contract if they are having problems delivering.
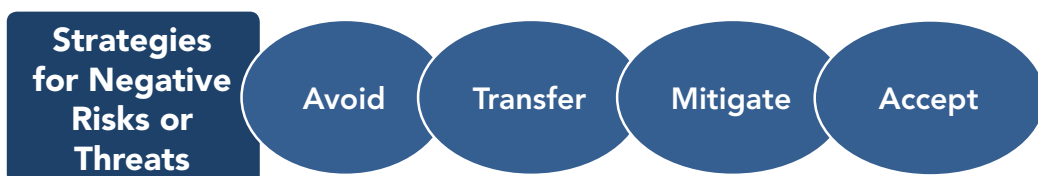
3. **Mitigate**—Taking early action to reduce the probability and/or impact of a risk occurring is often more effective than trying to repair the damage after it has occurred. Adopting less complex processes, conducting more tests, or choosing a more stable supplier are examples of mitigation actions.

4. **Accept**—The most common acceptance strategy is to establish a contingency reserve, including amounts of time, money, or resources to handle the risks. It is usually chosen either because: the risk is low in terms of impact or probability, or the cost and effort of taking a different action is out of proportion to the risk itself.

There are four possible strategies for dealing with opportunities.

Strategies for Positive Risks or Opportunities — Exploit — Share — Enhance — Accept
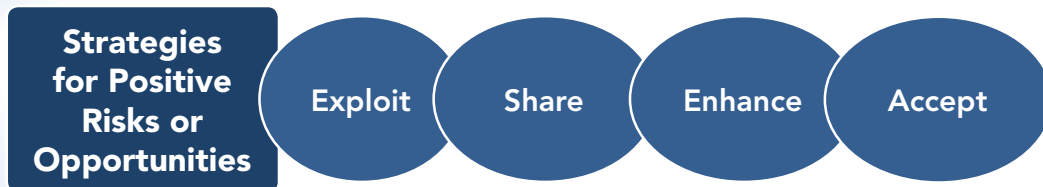
1. **Exploit**—examples of directly exploiting responses include assigning an organization's most talented resources to the project to reduce the time to completion or to provide lower cost than originally planned.

2. **Share**—sharing a positive risk involves allocating some or all of the ownership of the opportunity to a third party who is best able to capture the opportunity for the benefit of the project. Examples of sharing actions include forming risk-sharing: Partnerships, Teams, Special-purpose companies, or Joint ventures (JVs).

   These can be established with the express purpose of taking advantage of the opportunity so that all parties gain from their actions.

3. **Enhance**—examples of enhancing opportunities include adding more resources to an activity to finish early.

4. **Accept**—accepting an opportunity is being willing to take advantage of it if it comes along, but not actively pursuing it.

This is the process of implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project.

Planned risk responses that are included in the **project plan** are executed during the life cycle of the project, but the project work should be continuously monitored for new, changing, and outdated risks. There are several techniques that can be used to control risks

Reassessment

Project risk reassessments should be regularly scheduled to keep the risk register updated. The amount and detail of repetition that is appropriate depends on how the project progresses relative to its objectives, as well as, which risks (if any) actually manifest themselves.

Audits

These should be scheduled in the risk plan and examine the effectiveness of risk responses in dealing with identified risks and their root causes. The objectives should be clearly defined in advance and the audit may form part of the routine **project review** meetings, or may be run separately, each producing its own project **audit report**.

Trend Analysis

Earned value analysis and other methods of project variance and trend analysis may be used for monitoring overall project performance. Outcomes from these analyses may forecast potential deviation of the project at completion from cost and schedule targets. Deviation from the baseline plan may indicate the potential impact of threats or opportunities.

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┌─────────────────┐     ┌─────────────────┐     ┌─────────────────────────┐
│   Deviation     │     │   may indicate  │     │        Threats          │
│   from the      │─────│   the potential │────<│                         │
│  Baseline Plan  │     │    impact of    │     ├─────────────────────────┤
└─────────────────┘     └─────────────────┘     │      Opportunities      │
                                                 └─────────────────────────┘
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Performance Measurement

This is designed to indicate the degree of technical risk faced by the project. Where deliverables can be measured against the plans in a quantitative way e.g.: Response times, Number of defects, etc. This can predict the degree of success in achieving the technical aims of the project.

Reserve Analysis

This compares the contingency reserves remaining to the amount of risk remaining at any time in the project in order to determine if the remaining reserve is adequate.

Implementing contingency plans or workarounds sometimes results in a change request.

Recommended preventive actions are documented directions to perform on activity that can reduce the probability of negative consequences associated with project risks.

Recommended corrective actions include contingency plans and workarounds.

The latter are responses that were not initially planned, but are required to deal with emerging risks that were previously unidentified or accepted passively.

If the approved change requests have an effect on the process of managing risk, the corresponding component documents of the **project plan** are revised and reissued to reflect the approved changes.

KEY POINTS

✔ The risk plan defines the level of risk which is seen as acceptable, how risks will be managed, who will be responsible for carrying out risk related activities, the time and cost of each risk activity and how the communication of risk is to occur.

✔ Planned responses should be appropriate to the significance of the risk, cost effective in meeting it, realistic within the project context, agreed upon by all parties involved, and owned by a responsible person.

✔ There are four possible strategies for dealing with threats or risks that may have negative impacts on the project: avoid, transfer, mitigate and accept.

✔ There are four possible strategies for dealing with opportunities: exploit, share, enhance, and accept.

Summary

Project management is a complex activity that requires a structure, procedures and processes that are appropriate to your project. This will enable you to manage the inevitable changes that occur throughout a project's lifespan in a professional manner to ensure success. Each project function describes the expertise, skills and tools needed for your project.

So much work is now run as projects and so few people have the necessary skills to manage them properly that there is a huge demand for good project managers and that demand is increasing all the time.

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