

## Project Risk Management

### Risk management processes in PMBOK

The objective of project risk management is not to avoid risks entirely, but *to increase the probability and impact of positive events, and decrease the probability and impact of events adverse to the project*. Without risk-taking, new methods of efficiency, originality, and competitiveness can't be achieved, so the project risk processes make sure the costs of risks are weighed against the benefits they provide. The **Project Risk Management** knowledge area includes the processes that identify, evaluate, respond to, and monitor project risks. Pictorially:



Figure 1. Risk Management Processes in PMBOK

### Concepts

**Risk:** is any uncertain event that impacts one or more project objectives. Risks that are detrimental to project objectives are also called threats or negative risks while risks that are beneficial to the project are called opportunities or positive risks.

**Risk response:** These are the actions that will be taken prior to the risk taking place that reduce the probability or impact of a threat should it occur or increase the probability or impact of an opportunity

**Root cause:** The factor(s) that is the source of the risk. We need to understand what factors generate the risk so that we can better develop plans to influence the risk

**Trigger:** The signs, symptoms, or key event that warns us the risk is imminent or is now more likely to occur

**Probability:** An assessment of how likely it is that the risk event will occur. Risk responses try to influence probability before the risk takes place –our goal is to reduce the probability of negative impacts from occurring and increasing the chances of positive risks

**Impact:** The effect the risk will have, usually expressed in monetary, time, quality, or scope measures. Prior to the risk event taking place, our aim is to reduce or eliminate

the impact a negative risk will have (should it take place) or to increase the beneficial impact of a positive risk

**Contingency plan:** these are the actions that will be taken in response to a risk event that is imminent or which is occurring. Contingency plans aim to reduce the impact of a negative risk or increase the impact of an opportunity, and are used in combination with risk responses.

**Fallback plan:** what actions will be taken if the contingency plan proves ineffective

### Roles and Responsibilities in Risk Management

**Project manager:** the project manager is responsible for overall risk management and ensuring that it's properly coordinated with all other project management activities.

**Risk manager:** the person responsible for establishing and overseeing risk management processes and coordinating them with the project manager. The risk manager monitors risks and regularly communicating the risk status to the project team and stakeholders. The risk manager will hold some level of decision-making authority, and where that authority begins and ends needs be documented in the risk management plan

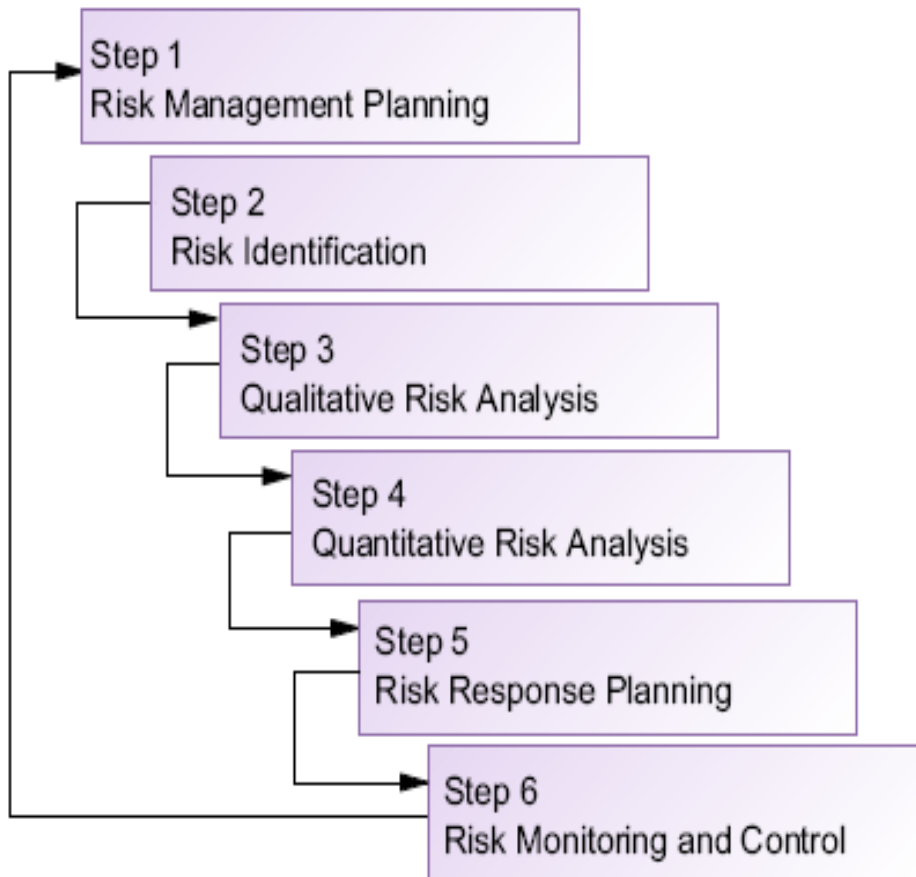
**Risk owner:** this is the person who has the skills and expertise necessary to best manage a particular risk. This role assists in developing the risk responses, contingency plans, risk actions, and monitors the risk.

**Risk action owner or risk response owner:** the person responsible for carrying out risk response activities for a particular risk

### Project Risk Management Steps

1. risk management planning
2. risk identification
3. qualitative risk analysis
4. quantitative risk analysis
5. risk response planning
6. risk monitoring and control

Pictorially:



**Figure 2. Risk Management Steps**

Managing risk is a continual process. It is a discipline; it is important to follow the steps methodically and thoroughly. Risk identification, qualitative/quantitative risk analysis, risk response planning and risk monitoring and control continue across the entire life cycle of the project

## Risk management planning – step 1

Process of deciding how to approach, plan, and execute risk management activities for a project. Process formality depends on Criticality; Resource availability; Time availability; Quality requirements. It must be ensured that the level, type, and visibility of risk management are commensurate with both the risk and importance of the project to the organization. Involves defining what risk management activities will occur; establishing the allotted time and cost for risk management activities; assigning risk management responsibilities; deciding how risk probability and impact will be measured; deciding on acceptable risk thresholds and tolerances

## Risk Management Plan

Risk management plan should consist of following components:

- Risk management methodology for the project
  - Risk management methodology, describing the approaches, tools, and techniques that'll govern how project risk management will occur
  - Risk categories
  - Common lexicon of risk terminology
  - Probability and impact scales, definitions, and estimating techniques
  - Formats and methods that'll be used for risk reporting
- Responsibilities for risk management activities
  - Risk roles as required for the project (risk manager, risk management team)
  - Responsibilities for subsequent risk management processes (risk identification, qualitative and quantitative analysis, risk response planning, and risk monitoring)
- Budget, schedule, and frequency of risk management activities
  - Activities needed for risk management (and incorporated into the project schedule)
  - Resources and costs allocated to risk management and risk activities as later defined and incorporated into project cost baseline
  - Frequency of risk management activities, such as risk reassessments and risk audits
- Tolerances, thresholds, and authority levels
  - Stakeholder risk tolerances
  - Tolerance levels and thresholds for risks
  - Decision-making authority levels and escalation paths

## Risk identification – step 2

Process of determining which risks (threats and opportunities) might affect the project and documenting their characteristics and is iterative in nature. Risk identification sources

- Field and marketing information
- Scope baseline (WBS)
- Activities and schedule
- Earned value data
- Project management plan
- Project documents (contract, company objectives and plans)
- Organizational knowledge base

Methods, tools and techniques

- Documentation review
- Information gathering techniques (workshops, brainstorming, interviewing)
- Modeling (cause and effect diagram, influence diagram)
- SWOT analysis

- Reviewing the risk assessment checklists

The output of the risk identification step is a risk register containing the following data:

- **Risk:** The name, description, and a unique identifier for the risk
- **Risk Owner:** The risk owner is the person in charge of monitoring and controlling the risk
- **Risk category:** The categorization from the risk management plan that the risk falls within. Changes may be requested to the categories originally defined in the risk management plan as risks are identified and analyzed
- **Root cause:** The core factor(s) leading to the risk. A risk may have multiple causes as well as multiple impacts
- **Potential response:** Responses to risks are planned in Risk Response Planning, but potential responses may become obvious during risk identification and should be captured in the risk register
- **Impact:** The risk register contains the specific details about what will be effected should the risk occur
- **Probability:** The probability of the risk expressed as a percentage or on a scale as defined by the risk management plan
- **Symptoms/Warning Signs:** Any specific conditions likely to trigger the risk or symptoms that the risk is about to occur should be identified. This will help during risk monitoring.
- **Risk Score:** The probability and impact score for the risk. This is obtained from a formula (usually probability x impact) defined in the risk management plan and generated from the probability and impact matrix
- **Risk Ranking/Priority:** This is the prioritization or relative ranking for the risk that allows efforts to be spent more effectively on the higher priority risks.
- **Risk Response:** The strategies and activities that will be taken to encourage and exploit a positive risk, or address a negative risk
- **Risk Response Responsibilities:** The risk action owners are people who have risk response actions to take
- **Secondary Risks:** Risk responses can often raise new risks
- **Risk Response Budget:** This is the budgeted cost to implement approved risk responses
- **Risk Response Schedule:** The scheduled activities necessary to put the risk response into action
- **Contingency Plan:** These are the actions that will take place should the risk response fail. The contingency plan also establishes under what criteria it's to be enacted
- **Fallback Plan:** The fallback plan is a backup to the contingency plan should it fail

### Risk qualitative analysis – step 3

Process of assessing the impact and likelihood of identified risks, and prioritizing them according to their potential impact on project objectives. It consists of 4 main steps:

1. estimating the **probability** that each identified risk event does or does not occur

Occurrence probability – percent or another measure, which presents in presence of allowed circumstances some kind of event occurrence

2. determining the **impact** of the risk event (the amount at stake or what can be lost)



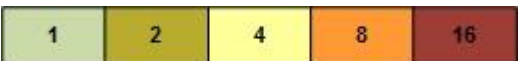
Risk impact – estimated as a cost, time, or quality measure, usually given in range (“between 25000 and 50000”, “between 7 days and 14 days”)

3. ranking the risks based on the probability/impact – assessments are converted into a rating through the matrix and used to establish a score for the risk – risks severity

4. prioritizing risks based on their severity

### Probability and impact scales

**Table 1 Probability and impact scales**

| Name  | Pictorially   |
|---|---|
| Relative scale (or ordinal scale)   |   |
| Liner scale (or cardinal scale) (numeric, intervals between designations are equal) |   |
| Non-linear scale (numeric, but intervals between designations are not equal)        |  |

### Probability and impact matrix

Assigns a rating or score to each risk based on its probability and impact assessments. The rating or scoring method is established in the risk management plan, and it converts assessments into linear, non-linear, or relative scale.

### Risks score and priority calculation example

Risks score = risks probability x risks impact

„Risk Y“

**Table 2. Risks probabilities**

|        | Very Low<br>1 | Low<br>2 | Medium<br>3 | High<br>4 | Very High<br>5 |
|--------|---------------|----------|-------------|-----------|----------------|
| Risk X |               |          | X           |           |                |
| Risk Y |               | X        |             |           |                |
| Risk Z |               |          |             | X         |                |

| Probability Rating                  |
|-------------------------------------|
| Very Low=10% estimated probability  |
| Low=30% estimated probability       |
| Medium=60% estimated probability    |
| High=80% estimated probability      |
| Very High=95% estimated probability |

A "low" probability rating for this risk correlates to a pre-defined 30% estimated chance that the risk will occur.

„Risk Y“ probability = 2

Risks impact criteria example

Table 3. Risks impact criteria example

|       | IMPACT RATING CRITERIA |                   |                   |                   |                   |
|-------|------------------------|-------------------|-------------------|-------------------|-------------------|
|       | Very Low               | Low               | Medium            | High              | Very High         |
| TIME  | 3 days or less         | 7 days or less    | 10 days or less   | 14 days or less   | 15 days or more   |
| SCOPE | <10 hrs of effort      | <20 hrs of effort | <30 hrs of effort | <40 hrs of effort | >40 hrs of effort |
| COST  | <\$1,000               | <\$1,500          | <\$2,000          | <\$2,500          | >\$2,500          |

Risks impact calculation result

Table 4. Risks impact calculation result

|        | TIME          |          |             |           |                | SCOPE         |          |             |           |                | COST          |          |             |           |                 | IMPACT RATING |
|--------|---------------|----------|-------------|-----------|----------------|---------------|----------|-------------|-----------|----------------|---------------|----------|-------------|-----------|-----------------|---------------|
|        | Very Low<br>1 | Low<br>2 | Medium<br>3 | High<br>4 | Very High<br>5 | Very Low<br>1 | Low<br>2 | Medium<br>3 | High<br>4 | Very High<br>5 | Very Low<br>1 | Low<br>2 | Medium<br>4 | High<br>8 | Very High<br>16 |               |
| Risk X |               | X        |             |           |                | X             |          |             |           |                | X             |          |             |           |                 | 4             |
| Risk Y | X             |          |             |           |                | X             |          |             |           |                |               |          |             | X         |                 | 10            |
| Risk Z |               | X        |             |           |                |               | X        |             |           |                |               | X        |             |           |                 | 6             |

Risk Y's impact rating is its impact on time + its impact on scope + its impact on cost: 1 + 1 + 8 = 10

„Risk Y“ impact = 10

„Risk Y“ score = 2 x 10 = 20

Using overall risks score:...

Table 5. Risk rating

**OVERALL RISK RATING**

|    |    |    |    |     |  |
|----|----|----|----|-----|--|
| 15 | 30 | 50 | 80 | 130 | >= 75 = very high priority risk<br>>= 35 and <75=high priority risk<br>>= 18 and <35=medium priority risk<br>>= 9 and <18=low priority risk<br><9 = very low priority risk |
| 12 | 24 | 40 | 64 | 104 |  |
| 9  | 18 | 30 | 48 | 78  |  |
| 6  | 12 | 20 | 32 | 50  |  |
| 3  | 6  | 10 | 16 | 26  |  |

... „Risk Y“ has medium priority

### Classifying risks by severity

Another example to estimate risks

Table 6. Risks classification by severity

|                    |          |               |              |
|--------------------|----------|---------------|--------------|
|                    |          | <b>Impact</b> |              |
| <b>Probability</b> | Low      | Moderate      | High         |
| High               | Moderate | High          | Unacceptable |
| Moderate           | Low      | High          | High         |
| Low                | Low      | Moderate      | Moderate     |

For example “Low risk” means requirements are documented in detail. All required functions are adequately explained including exception procedures, with no possibility of misinterpretation. Document is signed off by the responsible manager and user groups.  
 “Moderate risk” means that most of the requirements are documented. Most functions are explained but with some omissions. There is some room for misinterpretation. The document is signed off by the authoritative manager but not by user groups.  
 “High risk” means that there is only a high-level requirement statement or that requirements are documented but have omissions and are not formally signed off.  
 “Unacceptable” means there are no requirements.

### Risks prioritization

Prioritization risks to decide whether the risk events are worthy of attention



- Identifying top 10 major risks
- Ranking analyzed risk events from highest to lowest; Separately ranking risk events with similar severity; Prioritizing risk events as a team
- Developing response strategies for each
- Revising and reviewing the top 10 on a regular basis
- Using the top 10 as an agenda item for a regular project meetings

## Quantitative risk analysis – step 4

The goal is to establish more definitive probability assessments and solidifying scope, time, cost, and quality ramifications of risks. Performing on risks that have been prioritized by the qualitative risk analysis

- Data gathering and representation techniques - Probability distribution; Expert judgment
- Quantitative risk analysis and modeling techniques - Sensitivity analysis; Expected monetary value analysis; Failure Mode and Effects Analysis – FMEA; Fault Tree Analysis - FTA

## Planning risk responses – step 5

Process of developing options and determining actions to enhance opportunities and reduce threats to the project's objectives. Includes the identification and assignment of individuals or parties to take responsibility for each agreed to and funded risk response. Addresses the risks by their priority, inserting resources and activities into the budget, schedule, and project management plan, as needed. 4 classifications of response strategies - proactive behavior: eliminate uncertainty; allocate ownership; modify exposure; include in baseline

### Eliminate uncertainty

**Threat response** – avoid: Risk avoidance involves changing the project management plan to eliminate the threat posed by an adverse risk, to isolate the project objectives from the risk's impact, or to relax the objective that is in jeopardy

**Opportunity response** – exploit: This strategy seeks to eliminate the uncertainty associated with a particular upside risk by making the opportunity definitely happen

### Allocate ownership

**Threat response** – transfer: Risk transference requires shifting the negative impact of a threat, along with ownership of the response, to a third party

**Opportunity response** – share: Sharing a positive risk involves allocating ownership to a third party who is best able to capture the opportunity for the benefit of the project

### Modify exposure

**Threat response** – mitigate: Risk mitigation implies a reduction in the probability and/or impact of adverse risk event to an acceptable threshold

**Opportunity response** – enhance : Modifies the size of an opportunity by increasing probability and/or positive impacts and by identifying and maximizing key drivers of these positive-impact risks

Include in baseline

**Threat response** – accept: Indicates that the project team has decided not to change the project management plan to deal with a risk or is unable to identify any other suitable response strategy

**Opportunity response** – ignore: The same as for threat

Contingency strategy

A contingent response involves a contingency plan, which will be put into effect should the risk response fail. The contingent response identifies the exact situation and circumstances (triggers) in which the contingency plan can be put into effect and when it can be discontinued. This response type is used in combination with another risk response, such as mitigation. Regardless of the primary risk response strategy, a contingency plan should be in place for all but the lowest priority risks (and even those depending upon what objectives they can impact). The fallback plan kicks in if the contingency plan fails. It can be looked at as a contingency plan for the contingency plan. The fallback plan spells out steps will be taken to recover if the contingency plan fails, and it specifies under what situations and circumstances it is activated and subsequently deactivated

Risk monitor and control – step 6

Consists of following steps:

- tracking identified risks;
- monitoring residual risks;
- identifying new risks;
- executing risk response plans;
- evaluating their effectiveness throughout the project life cycle

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