

JEREMIE AVEROUS

Practical
Project Risk
Handbook
for
Project Managers



*A Guide to
Enhance Opportunities
And Manage Risks
on Large, Complex Projects*



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Chapter 1: What are the Actual Mechanisms of Project Opportunities & Risk Management?

“I’ll never be aware in advance of all possible single points of failure, but if I do a risk analysis, I’ll be aware of many of them, which will leave me more time to deal with the ones I was not aware of”

- Gerald M. Weinberg

Introduction

Project Opportunity and Risk Management as a process has proven its value by helping organizations to deliver more predictable Project results on a consistent basis and to allow negotiation of more appropriate terms and conditions in their relationships with the other key stakeholders involved.

It is important to reflect on what the actual objectives and fundamental mechanisms of this process are; they are not straightforward as one might think and need to be examined in detail.

These objectives will serve to inform a number of considerations we will develop further in the handbook. In any case, this handbook is written from the point of view of the Project Manager, so it is important to examine exactly what is the added value of the process to the Project and to

the organization as a whole. Let us start by pointing out some important concepts.

Opportunity and Risk Management is Ultimately about Making Decisions

The Project Opportunity and Risk Management process is at the service of the Project decision-maker to give a fair picture of the situation as it is known by the Project team and the organization. Ultimately, this will serve to inform decisions and actions from the Project team.

It is important to keep in sight that the first objective of this process is effectively to support the decision making process and ensure that decisions are made in full knowledge of potential Opportunities and Risks. Sometimes unfortunately the Opportunity and Risk management process becomes a required bureaucratic process that people do because it is a requirement more than because it serves and supports their purpose. This is wrong and it is a waste of resources.

The Opportunity and Risk management process must always be run having in mind that the objective is to guide the decision-maker into action. Effectiveness of the process will be measured by the effectiveness of the action stemming from it, divided by how onerous the process in itself was. The ideal process is very light on the Project team and creates tremendous value by guiding key decisions that make Project execution possible and smooth.

The A in ORSIPARM (Opportunities & Risks – Scanning – Identification – Prioritization – Action – Reserves – Monitoring) acronym is there to remind that the process is all about action-taking.

Key benefits of Risk and Opportunity Process

Key benefits of the implementation of a sound Opportunity & Risk process include:

- Identify key execution uncertainties to enable effective **management focus**,
- Improve **communication & Risk awareness**,
- **Minimize** the need to manage continuous or **frequent crisis**,
- Provide **early warning** on key upcoming events that will, if left by themselves, disturb Project execution,
- Provide a **sound basis for key project execution decisions** such as the consideration of changes to the project scope (e.g. significant additions), or even decisions such as going for a claim and arbitration,
- Assist in the development of **realistic Project targets**,
- Oblige to make the effort to identify and pursue **Opportunities**,
- Serve as a basis for **contractual terms & conditions** with stakeholders (Owner and contractors),
- Form a basis for the determination of **contingency reserves**.

These key benefits are applicable both in the tendering and execution phases, in particular:

- In the **tendering/ study phase**:
 - Providing support for the Main Contract(s) qualifications and exclusions,
 - Supporting the choice of an execution strategy that minimizes risks and enhances opportunities,
 - Calculating an adequate amount of contingency to be included in the base cost.
- In the **execution phase**:
 - Ensuring an adequate identification and attribution of actions throughout the team to mitigate risks and promote opportunities,
 - Providing a framework for sharing openly between Owner and Contractor what are the potential Opportunities and Risks for the project overall, thus

being an effective tool for dispute prevention and reduction (as an example the NEC3 form of contract mandates a shared risk management process),

- Ensuring proper communication and awareness on Opportunities and Risks throughout the Project team,
- Providing support for suppliers' and contractors' contract terms,
- Providing support as to the progressive release of contingency reserves.

Useful Concepts and Definitions

Opportunities and Risks versus Events

An Opportunity, or a Risk, is the measure of potential gain or loss, in terms of both the associated event and the probability for this event to happen and impact favourably or unfavourably the Project objectives.

It is distinct from the notion of 'Hazard', or 'Threat', or 'Event' which describes only an uncertain potential event. As a concept, 'Opportunity' or 'Risk' includes in addition some understanding as to the related probability of occurrence, and the related consequences.

For example, a lottery ticket is an opportunity because it is associated both with a probability and an amount that can be won. The act of randomly throwing numbers to choose the winner is just an event.

Known-Unknowns and Unknown-Unknowns

As a useful concept for risk-related conversations, the following table summarizes the three different types of Project Opportunities and Risks.

Known – Known	What needs to be in the Project baseline, in a comprehensive manner.
Known – Unknowns	What needs to be identified in the risk & opportunity register, and tackled through effective action. The contingency is a money and time reserve partially aiming at addressing these issues.
Unknown-Unknowns	By definition, these can't be anticipated and identified beforehand. The organization mainly (and the Project to some extent) must maintain vigilance and a degree of reserves to deal with these issues. Scanning the project environment is key to identify Unknowns- Unknowns early (the 'S' in ORSIPARM).

Probability and Consequence

Risks and Opportunities both have some probability of occurrence as well as a potential impact (consequence) if they occur.

This however is a fairly simplistic view as risks and opportunities have a range of probabilities associated with a range of relative impacts (consequences). For example, when it comes to the opportunity of winning at the lottery, there is a very low probability of winning millions but there

is at the same time a higher probability of winning a small amount¹.



For simplification purposes, most Opportunity and Risk processes simplify the probability/ consequence mapping to a single point which generally corresponds to a ‘reasonable worst case’ scenario. We must be aware that it is not always a relevant simplification, and it can sometimes be questioned. Advanced approaches could consider a more thorough continuum in the probability x consequence space, however these approaches are rarely used in Project Opportunity and Risk management due to their complication.

Risk appetite

Every organization has a certain risk appetite, i.e. the acceptable limit of risk that the organization is willing to take. Some of this risk appetite is driven by social or regulatory pressure (like for example, in the field of personnel safety), while some aspects are purely a choice (like for example, when it comes to financial parameters). Entrepreneurs or newcomers on a market for example, have typically a higher risk appetite compared to established companies.

The risk appetite is typically formalized through a matrix which shows, on a probability/ consequence mapping, what are the acceptable areas, and those that are not acceptable. This matrix should be specific to organizations and even to Projects when it comes to relevant financial parameters (ref. Chapter 6 discussion on the definition of thresholds).

Risk appetite matrices are often defined in organizations for single Projects’ Opportunities and Risks; in Chapter 3 we will discuss the need to define, as well, risk appetite at the Project portfolio level, and give a specific technique to describe that portfolio risk appetite.

¹ It is a way for lottery managers to entice people to play by getting them to win small often enough.

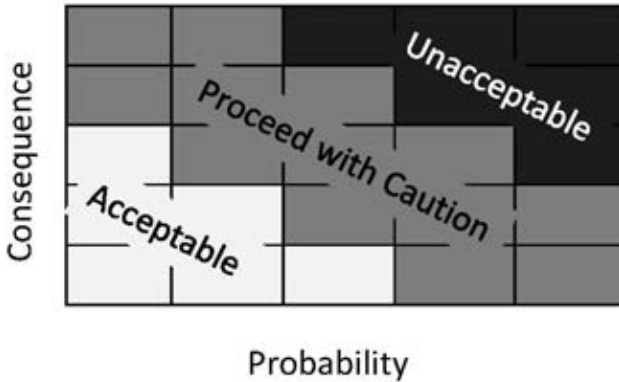


Figure 1: A typical consequence/ probability matrix (reflecting the organization's risk appetite)

Basic Opportunity and Risk Management Strategies

There are 4 basic Opportunity and Risk management strategies:

- Avoid
- Reduce (Risk) or Enhance (Opportunities)
- Transfer/ Share
- Accept

Any action plan will always include at least one of these four components.

Contingency and Allowances

In this handbook, **Contingency** is a single reserve that is budgeted so as to cover up to reasonable level, uncertainties as to the execution of a Project (Known-Unknowns). When setting up the price for a Project, cost contingency is an amount of money that is considered as a cost element. A schedule contingency can also be considered and included as a time element.

It is important to underline that contingency is a single amount of money or time for the entire Project; it cannot be

split or assigned to any single budget line item or activity. If contingency was to be allocated line-by-line, its total amount would be much greater, resulting in a much lower competitiveness at tender or decision stage. Also, it is not allowable to pad the estimate of each line item; all contingency should be brought together. Thus, cost line items and schedule durations should correspond to expected achievable values (refer to our Cost and Schedule handbooks).

It is also essential that the ownership of the contingency be with Senior Management. This is to ensure that these reserves are being used in the most effective manner when they are required and avoid the tendency for Project Managers to use it to compensate for performance issues.

Contingency shall not be confused with **Allowances**. Allowances are specific amounts of money or time that correspond to costs or durations that are not fully defined but for which there is a high certainty that they will happen. Allowances are defined by budget line items or schedule activity and are generally justified by lessons learned, past experience, or the knowledge of costs or additional durations that will happen. For example, in fabrication, the quantities defined by engineering at the first stage of design must generally be completed by allowances to properly estimate the final quantity forecast. Another example is in engineering where allowances for engineering management and coordination should be factored in, on top of the basic man-hours budgeting or man-hours-based scheduling.

Allowances again should not be confused with **loadings**, which is an amount of money that is certain to be spent and can be added to the basic amount of a purchase order to cater for related services such as inspection and logistics.

Terminology issues around 'Contingency'

In certain organizations (generally Owner organizations), 'Contingency' has a different definition and usage. The term '**Management Reserve**' is used for an amount of reserves owned by Senior Management. It is more or less equivalent to what we call in this handbook 'Contingency', with some organizations adding additional amounts to cover 'Unknown-Unknowns' in 'Management Reserve' as well.

What is then called 'Contingency' in these organizations is an amount of money that is owned by the Project Manager, spread amongst all the cost lines and often released according to the project progress. We have three concerns with this approach:

- Having the Project Manager 'own' contingency money can be dangerous regarding project performance reporting,
- We believe that the approach of releasing automatically 'contingency' following project progress is not adequate: contingency needs to be reassessed based on future project risk, as assessed based on the current knowledge,
- Also, we believe that contingency needs to be a single amount kept at management level, and should not be spread by activity, as it defeats the purpose of providing a reserve against major events that will have consequential effects.

As a note, a number of experts mention that in large Owner organizations it can make sense to differentiate a contingency owned by the Project Manager and a contingency owned by senior management, because of the bureaucratic hindrance to get approval from Senior Management on anything. This is a matter of debate. We still believe that it is more appropriate that contingency be owned by Senior management.

As another issue, the term '**Provisions**' is used in accounting to cover liabilities of uncertain timings or amount that relate to obligations resulting from a past commitment. The utilization of provisions is strictly limited and controlled in accounting as they in effect diminish the present profit of the organization. In a project, contingency (or the part that corresponds to the current progress of the project) can be recognized accounting-wise as a provision for risk, if it is derived in an auditable manner following a sound approach that is accepted by the company auditors. We will not use the terminology 'provision' in this handbook to reserve it to accounting.

Probabilistic values

Regarding statistical distributions, we will often refer to **PXX** where XX is a number between 0 and 100. This notation refers to the point in the statistical analysis where XX% of the distribution is below the point. For example:

- P50 is the median value – by definition the point for which 50% of the distribution is situated below and 50% is above (it will be different from the mean value for skewed statistical distributions),
- P80 is a value for which 80% of the distribution is below and 20% is above – in other terms, there are only 20% chances that the value of the distribution is above P80, and 80% chance that it will be below.

The Risk Engineer Profile and Role

Most mature Project-driven organizations have setup a specific process, supported by a specific function, to deal with Opportunity and Risk.

It does not take a lot of specialist time to run this process even in large organizations; hence most of the time Opportunity and Risk specialists (which we will call in this handbook Risk Engineers) share their time between different tenders and Projects. Only very large and complex Projects warrant a full-time embedded Risk Engineer, for the first half of the Project.

The qualities of Risk Engineers include:

- Excellent facilitating skills to facilitate effective workshops,
- Good knowledge of the quantitative assessment tools (cost Monte Carlo and Schedule Statistical Analysis), their limits and their proper utilization,
- Understanding of contractual terms and conditions,
- Some general knowledge about the industry (to understand what is being discussed), complemented by a good general understanding of the business context.

Relatively junior personnel, such as planners or graduate engineers, can be quickly trained to become Risk Engineers. In our view, facilitating and communication/listening skills are essential in this position. It is relatively easy to learn how to run specialist tools; however it is essential to have a sound business understanding so as to be able to challenge inputs and prioritize efforts.

Becoming Risk Engineer is a great opportunity of professional development for junior staff with a few years' experience because it allows touching immediately diverse disciplines and being involved in Project commercial issues. On the other hand, one issue most organizations face is the career development of Risk Engineers, because it is a position that does not offer high perspectives of career progression in the same discipline. Risk Engineers will generally evolve into other roles in the organization after a few years, or continue to support the Opportunity & Risk process on a very part-time basis while focusing on other activities. This often does not help to develop a stable functional experience, and this requires Project Managers to understand the fundamentals of the process to challenge the Risk Engineers they are assigned – which is one purpose of this handbook.

A great way to develop Risk Engineers is also to have engineers take the role together with Industrial risk management, facilitating and conducting technical risk assessments (ref. Chapter 8).

Risk Engineers are also called sometimes Risk Analysts, or Risk Facilitators.

The Mechanisms of Project Opportunity and Risk Process

Opportunity and Risk Management process objectives

As explained in the introduction, the objectives of the Project Opportunity and Risk process for a single Project are multiple and can be seen as sometimes contradictory:

- During Project execution, protect the Project against the most obvious risks and better exploit obvious opportunities,
- During tendering, still maintain competitiveness and economic attractiveness by implementing reasonable actions and not requiring excessive contingency (in cost and schedule).

The only way to resolve this contradiction at the tender or Project level is to create the conditions of a structured conversation within the Project team around Opportunities and Risk with the aim to guide actions along the four basic management strategies. There is no right or wrong answer – the tender or Project balanced position will depend on the risk appetite and the circumstances.

There appears a contradiction between these two objectives because fundamentally, building nothing or raising the most expensive barriers are always a way to get rid of risks or opportunities. And dealing with Opportunities and Risks always has an implied cost. However in reality, most Opportunities and Risks have “windows of opportunity” where relevant effective management strategies are available for a limited time, with a limited expenditure. It is thus possible through the implementation of clever strategies, to improve significantly the resilience of project execution with a minimum expense.

Opportunity and Risk Management process fundamentals

We can distinguish the 4 following mechanisms by which sound Opportunity and Risk management processes reach these objectives:

- Be clear about the **Project purpose** and detailed objectives,
- Identify **as early as possible** and tackle as early as possible obvious Opportunities and Risks,
 - Try to Avoid and Transfer as many Risks as possible to other parties,
 - Mitigate remaining risks/ enhance remaining Opportunities based on a sound prioritization,

- Create space for dealing with the inevitable 'Unknown-Unknowns' during Project execution.
- **Share** an understanding of the picture **with the entire Project team**, with the aim to:
 - Ensure that the team's cumulative experience is taken into account and benefits the project,
 - Improve communication about Opportunities and Risks within the team,
 - Raise the awareness on the consequences of certain actions that are taken by team members so as to prevent acts that would significantly expose the Project team,
 - Distribute and track actions to relevant team members, to make sure they are completed in a timely manner,
- Evaluate and have available an **amount of reasonable protection and reserves** (in time and cost) that the Project and/or the organization needs to carry to cater for possible risks. These reserves should be pooled at an overall Project level and not maintained in individual levels to keep them reasonable.

The Need for Portfolio Level Management

A significant part of Opportunity & Risk management always occurs at the Project Portfolio level, which is the organizational level, and not just at the single Project level. It is essential that organizations and Projects understand this issue. Unfortunately, while single Project Opportunity and Risk management is a process embedded in many Project-driven organizations, the portfolio level is not embedded with the same attention and rigor. It is often left to operational decisions.

The portfolio level is relevant because it is the level at which organizations do report their financial performance. At portfolio level, except in the case of rare catastrophic risks, the opportunities and risks of different Projects should tend to average out. However there are some instances where it is not the case – in particular, the averaging out supposes that the Projects in the portfolio are independent. All possible dependencies, which are in effect

managed by the organisation, are sources of Opportunities and Risks for the organization.

The issue of sharing key resources will lead to the issue of **Cost of Opportunity**: there is an intrinsic cost for a Project not to follow the original plan of usage of a resource, because of the consequential effects of that event. This issue is not at all visible at the individual Project level, yet it might impact significantly the organization as a whole.

Because the issue of Portfolio-level Opportunity and Risk Management is so important yet so often neglected, Chapter 3 is devoted to this issue.

Conclusion

In this Chapter we have sought to give a quick description of the drivers and of the environment in which Project Opportunity and Risk Management is being applied. Useful definitions have been given that will be used throughout the book.

The Opportunity and Risk process should not be applied for the sake of ticking a box – it should be applied with the end in mind, which is to protect the organization and make it thrive. Beyond the single Project approach, portfolio-level management becomes from that perspective, a key approach for Project-driven organizations, which is not always implemented with the appropriate attention or explicitly enough.

Chapter 2: Project Opportunities and Risk Golden Rules

The main objective of Opportunity and Risk management is to enable the Project Manager and its management to take decisions to improve the likelihood of a successful project outcome derived from the organization's current knowledge and understanding of reality (which understanding is enhanced by the usage of the analysis tools provided by the Opportunity and Risk management process)

From this broad objective, a number of Golden Rules describe the basic requirements of Opportunity and Risk management.

In all instances the following 16 Golden Rules need to be followed:

1. **Team Responsibility:** The Project team as a team is responsible for the proper implementation of the Project Opportunities and Risk Management process, and in particular, for the identification and brainstorming of the Opportunities and Risks, their prioritization, and for implementing subsequently the actions that are identified.
2. **Focused action-taking is essential** when it comes to mitigating risks or enhancing opportunities. There needs to be a proper prioritization process in place to focus energy and effort on a very limited list of topics.

3. **The earlier action is being taken, the most effective and the less onerous it will be.** It is essential to start an effective Opportunity and Risk management process as early as possible during Project preparation and tender stage. Even during execution stage, early decisions are always more impactful and less onerous.
4. **Continuous Scanning, Monitoring and Review:** to ensure Opportunities and Risks are continuously identified and communicated appropriately, add Project Opportunities and Risks discussions as a standing topic to the team's regular meetings.
5. **Use all opportunities of contractual relationships with stakeholders (Client, Suppliers/Contractors) to transfer/ share Opportunities and Risks.** Opportunity and Risk management is essential at both the contracting and procurement stages.
6. **Avoid double-dipping and do not confuse Allowances and Contingency,** they need to be identified separately and double dipping needs to be absolutely avoided between those to avoid excessive conservatism.
7. **Contingency is a reserve that aims at protecting the Project in a reasonable manner. It should be owned by Senior Management.** Most Projects should not use the contingency (either in cost or time) and should release it; some will use the contingency to compensate for unexpected events. The amount of contingency is a matter of judgment.
8. **Schedule Statistical Analysis should be aiming at improving the resilience of the schedule,** and not necessarily at predicting the completion date.
9. **In Projects, "time is of the essence", most of the cost risk is deeply related to schedule slippage.** Focus your risk mitigation efforts on preserving the schedule.

10. **Cost contingency calculation and Schedule Statistical Analysis should be done on models with limited complication** (20-40 lines for the cost model and no more than 200 activities for the simplified schedule) to provide useful results as well as to ensure consistency of results between Projects in a portfolio.
11. **The main Project killer risk is common cause risks, consequential impact and/ or snowballing risks.** Avoid these risks by sound root cause analysis of identified risks. Effectively evaluate the potential impact of an event through its possible consequential impacts.
12. **Low probability, high consequence risks (catastrophic risks) are historically those that derail Project-driven organizations.** Substantial focus should be devoted to preventing such catastrophes that cannot be effectively dealt with through conventional Project Opportunity and Risk management methods.
13. **Keeping the ability to cut your losses in case of emergency is essential.** This is why termination clauses for Owners and strong limit of liability clauses for Contractors are an essential component of Project Risk management.
14. **On Large Projects, focus on minimizing complexity as much as possible** as a way to make the outcome of the Project more predictable. Integrated teams, minimization of the number of contributors and their alignment all contribute to that objective.
15. **Project Portfolio level Opportunity and Risk management is required.** This deals in particular with shared resources and Cost of Opportunity. The intrinsic protection afforded by the Project portfolio depends on an upper Project size limit, on the diversity of the Projects in the portfolio, and on the avoidance of 'long tail' effects.

16. **Do not neglect the psychological issues related to managing risk**, in particular the phenomenon whereby people tend to minimize failure with the hope of a miracle, thereby delaying the realization that a Project is sinking fast, and the much required cut-loss actions.

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