FORUM FASILITAS PRODUKSI MIGAS 2023

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Implementing Risk Mitigation Strategies in EPC Project

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Summary

The objectives of project risk management in EPC projects are to increase the probability and impact of positive events and decrease the probability and impact of events adverse to EPC project objectives. **Challenges faced in preparing the risk management plan are personnel knowledge, skills, competence/training, and experience in handling project risk management, including knowledge of distinguishing between risks, issues/problems.**

Based on historical project performance, a huge number of O&G projects, which are typically bound by EPC contracts, dealing with cost overruns and schedule overruns. To anticipate and prevent this event in the future, the implementation of risk management strategies must be performed properly in the EPC project. Several key activities are defined, such as assigning a dedicated risk team at project level, robust and continuous risk review, identifying and assessing project risk by PM and team, reviewing risk based on a check list from past experiences, creating an action plan for each identified risk, reviewing and escalate risk across different organization levels, and defining checkpoints for risk review and re-evaluation.

As an effort to enhance risk management excellence, EPC company are suggested to develop talent competency, dedicated risk officer at project level as facilitator, PM competency in risk identification by project experience and training/certification, risk management tools to manage action required by each function, develop process for instance identify gap between current procedures and best practice (internal company & global), update and review risk management procedures (e.g., cadence in risk review), establish dedicated risk officer at project level, align and get approval for changes in risk management procedures and implement and communicate changes in risk management procedures, establish regular & rigorous audit on risk procedures implementation across all projects and relevant function for risk management including implementation of roles for risk analysis throughout Project Life Cycle (PLC).

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Presentation Outlines

Project Risk Characteristic **01**

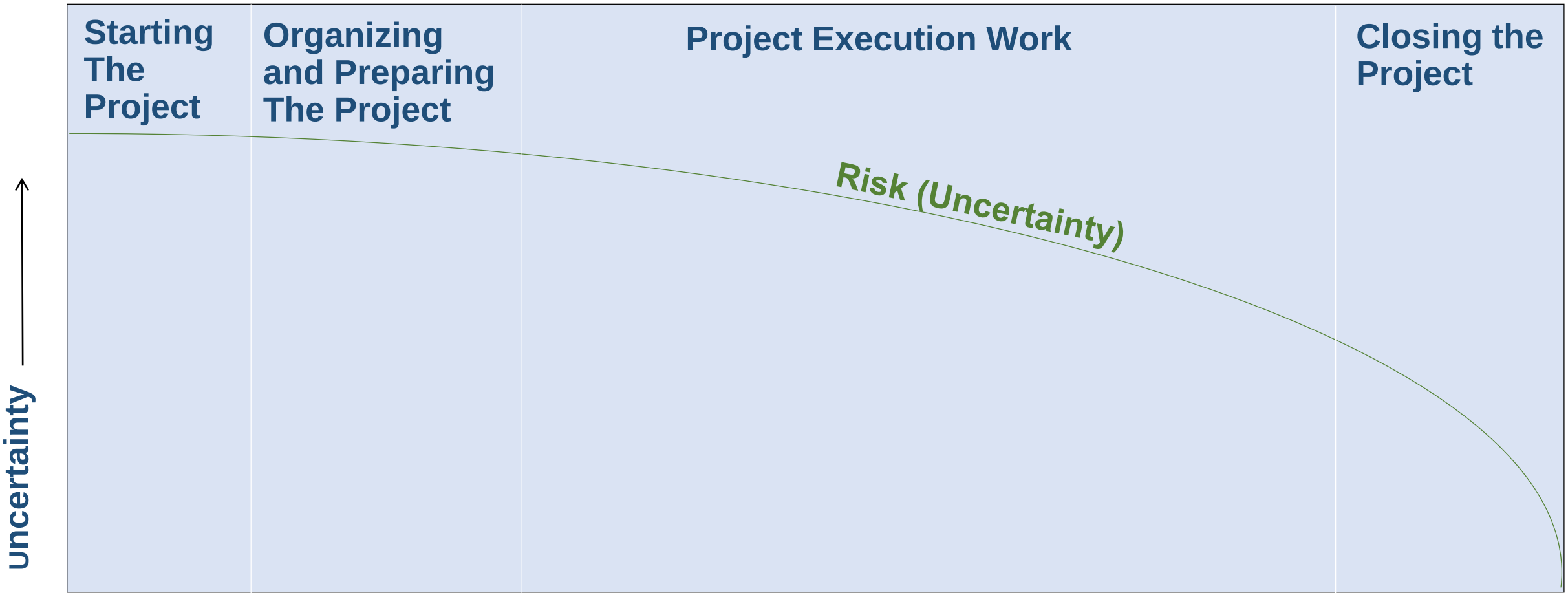
Project Risk Management **02**

Problem and Typical Risk in EPC Project **03**

Mitigation Strategies & Recommendation **04**

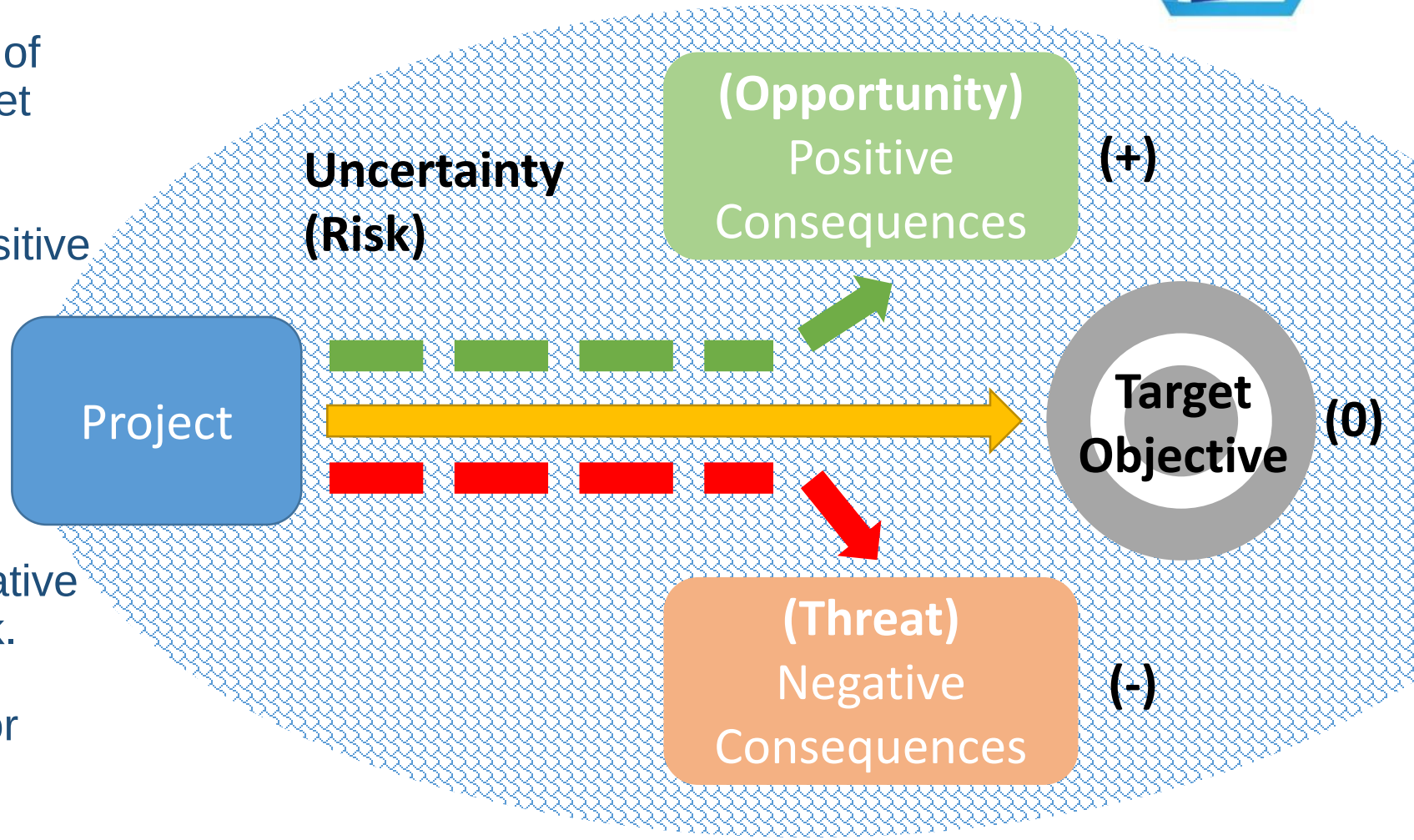
1. Project Risk Characteristic

Project Uncertainty/ Risk Through Project Timeline



Project Risk Effect

- Risk includes the effects of any of the forms of uncertainty on target obejectives.
- The uncertainty may lead to positive or negative consequences.
- Negative risks are known as Threats and positive risks as known as Opportunities.
- A risk that can only have a negative consequence is called Pure risk.
- A risk that can have a positive or negative consequence is called Business risk.



Project Risk Consequences

Negative Risks	Positive Risks
▪ Avoid ▪ Transfer ▪ Mitigation	▪ Exploit ▪ Share ▪ Enhance
ACCEPT	
THREATS	OPPORTUNITIES

Remember, after a risk occurs, it is no longer "an uncertain event or condition", it becomes an issue/problem. Issues/problem should be resolved immediately or have a workaround instead.

2. Project Risk Management

Project Management

Foundational Element

Project Definition

- A Project is a temporary endeavor undertaken to create a unique product, service, or result.

Project Management Definition

- Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.
- Project management is accomplished through the appropriate application and integration of the project management processes identified for the project.

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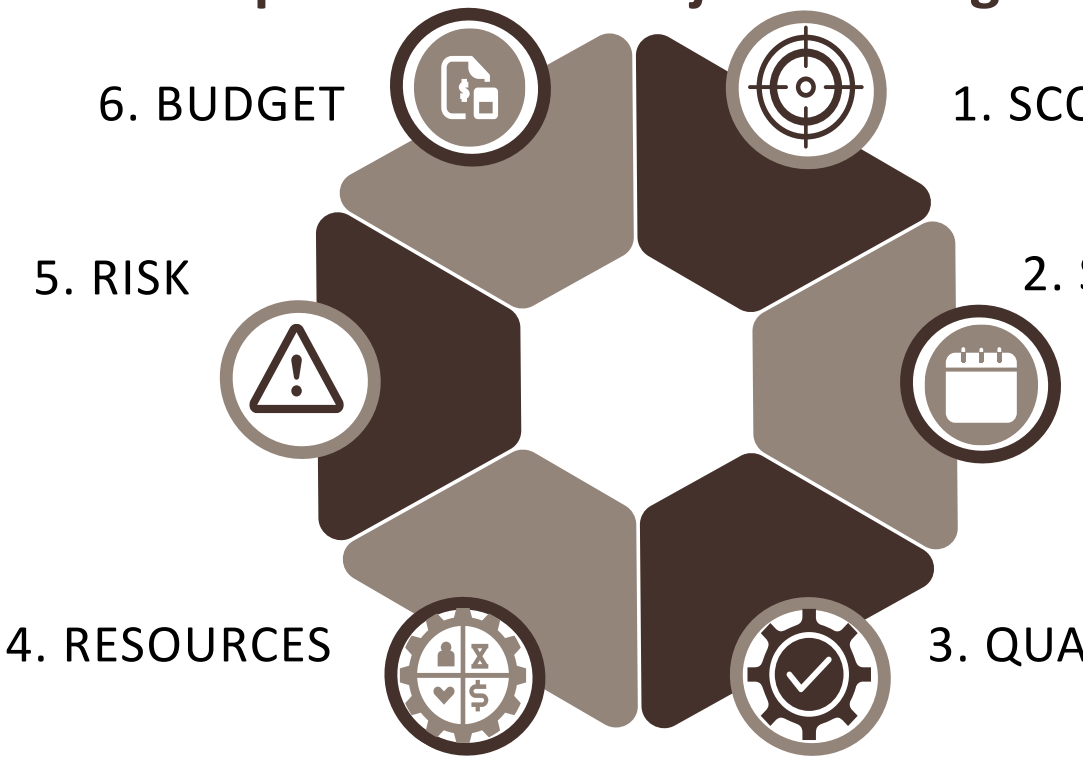
The Importance of Project Management



Effective project management helps individuals, groups, public, and private organizations to meet business objectives, to satisfy stakeholder expectations, to manage constraints (e.g., Scope, Quality, Schedule, Resources, Risks, Budget)

Project Risk Management

Project risk management includes the processes of conducting risk management planning, identification, analysis, responses planning, and controlling risk on a project.

1. **Plan Risk Management**
2. **Identify Risk**
3. **Perform Qualitative Risk Analysis**
4. **Perform Quantitative Risk Analysis**
5. **Plan Risk Responses**
6. **Control Risks**

Uncertainty :

- Known
- Known-Unknown
- Unknown-Unknown

Impact to objective of :

- Scope
- Quality
- Schedule
- Cost

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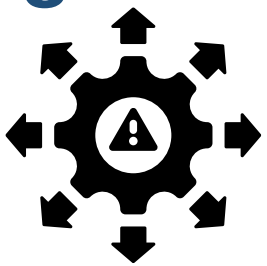
Risk Categorization

1 

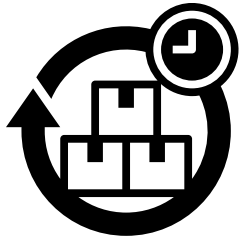
EXTERNAL RISKS

Arise out of external factors, for example, regulatory or governmental policies, subcontractors, suppliers, environment, etc.

2 

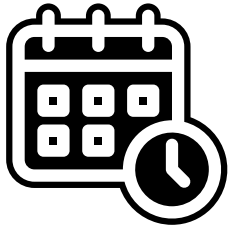
INTERNAL RISKS

Arise within the project, for example, funding, resources, prioritization, etc.

3 

TECHNICAL RISKS

Arise out of technology being used, for example, requirements, technology, quality, etc.

4 

PROJECT MANAGEMENT & COMMERCIAL RISKS

Arise out of project management activities, for example, estimating, planning, schedule, communication, etc.

Risks can also be classified based on their origin: SCOPE RISKS, RESOURCE RISKS, SCHEDULE RISKS, COST RISKS, and QUALITY RISKS.

Calculation Of Risk

Risk can be managed only if they are measured quantitatively.

- Risk is measured by assigning a monetary value to it
- Risk is calculated by multiplying probability and impact of risk

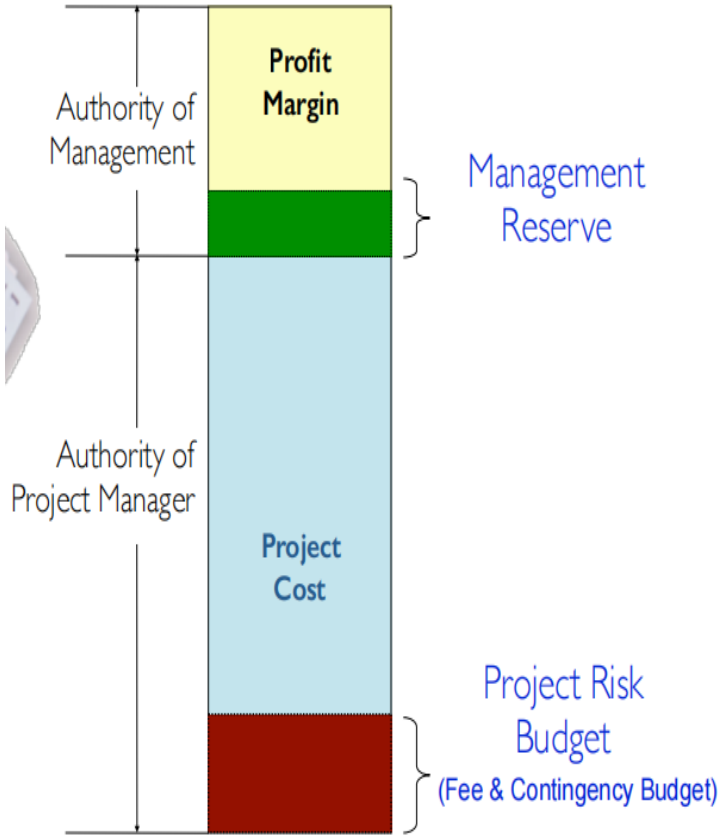
Work Packages	Probability	Impact
X	25%	$ -10.000,00
Y	40%	$ -2.000,00
Z	10%	$ 20.000,00

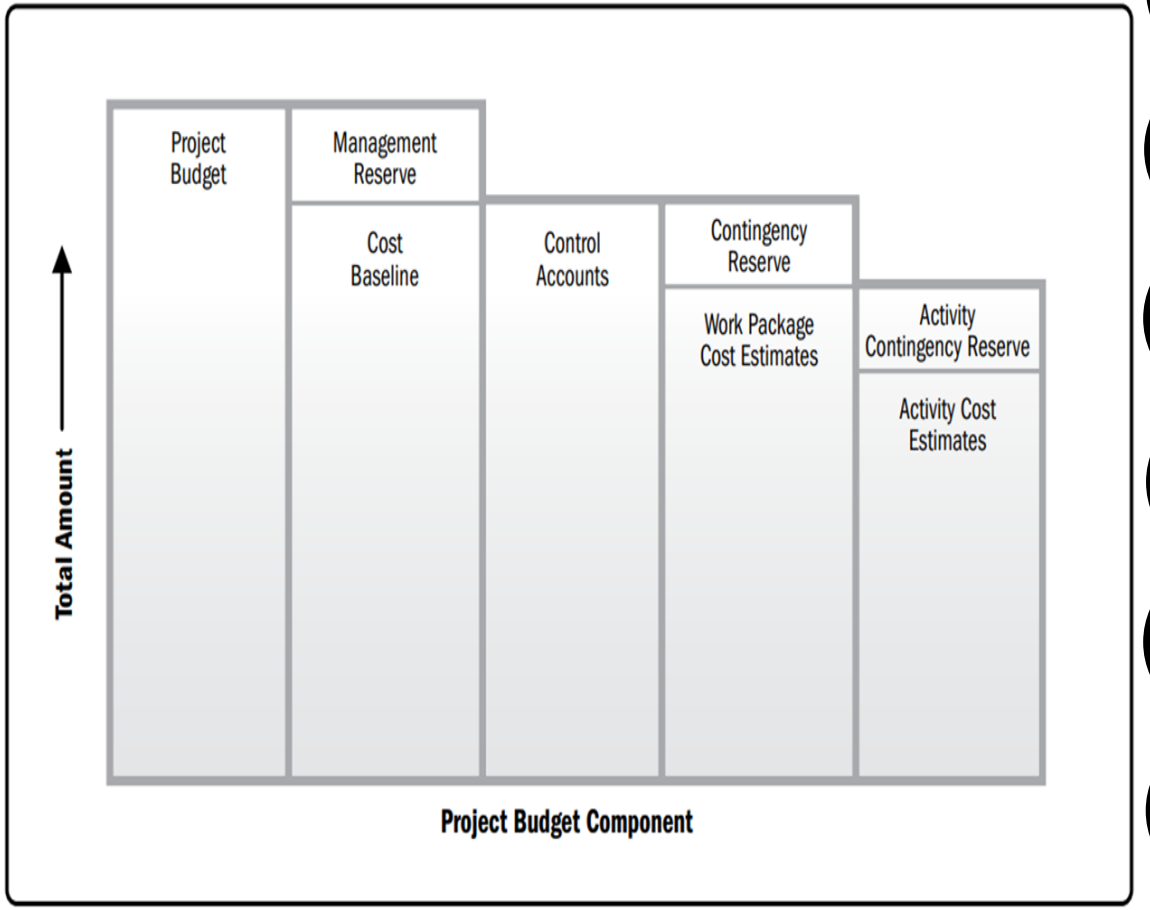
RISK EXPOSURE = RISK PROBABILITY * RISK IMPACT

Risk probability is the likelihood that a risk event could happen and risk impact is the effect on the project objectives if a risk event happens

Work Packages	Probability	Impact	Expected Monetary Value (EMV)
X	25%	$ -10.000,00	$ -2.500,00
Y	40%	$ -2.000,00	$ -800,00
Z	10%	$ 20.000,00	$ 2.000,00
		TOTAL EMV	$ -1.300,00

Risk Reserve Vs Cost Management Reserve





1. ACTIVITIES
2. WORK PACKAGES
3. CONTROL ACCOUNT
4. PROJECT
5. CONTINGENCY RESERVE
6. COST BASELINE
7. MANAGEMENT RESERVE

Project Management Institute, A Guide to the Project Management Body of Knowledge, (PMBOK® Guide) – Sixth edition, Project Management Institute, Inc., 2017

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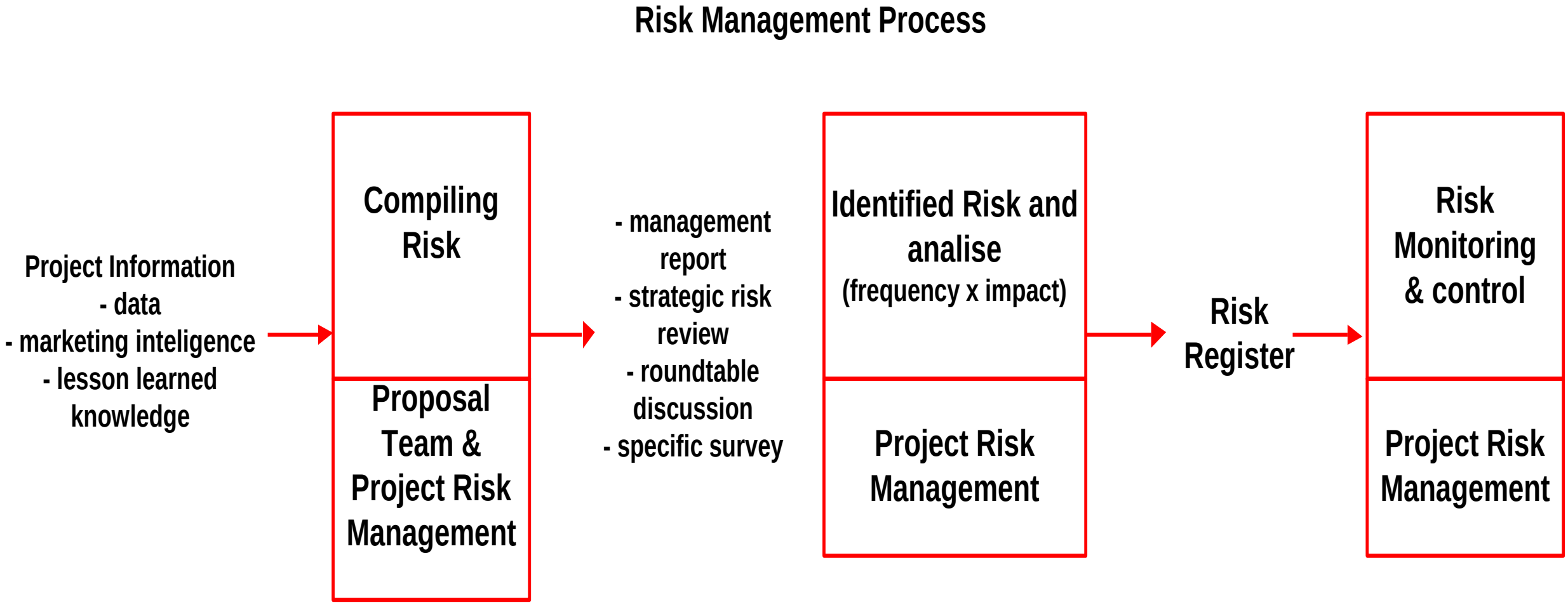
Risk Management Process

Plan Risk Management	Identify Risk	Qualitative Risk Analysis	Quantitative Risk Analysis	Plan Risk Responses	Monitor and Control Risk
The process of defining how to implement risk management activity throughout the project.	The process of identifying individual project risks as well as sources of overall project risk, and documenting their characteristic.	The process of prioritizing individual project risks for further analysis or action by assessing their probability of occurrence and impact as well as other characteristic.	The process of numerically analyzing the combined effect of identified individual project risks and other sources of uncertainty on overall project objectives.	The process of developing options, selecting strategies, and agreeing on actions to address overall project risk exposure, as well as to treat individual project risks.	The process of monitoring the implementation of agreed-upon risk response plans, tracking identified risks, identifying and analyzing new risks, and evaluating risk process effectiveness throughout the project.

Risk Management Process



Risk Management Process

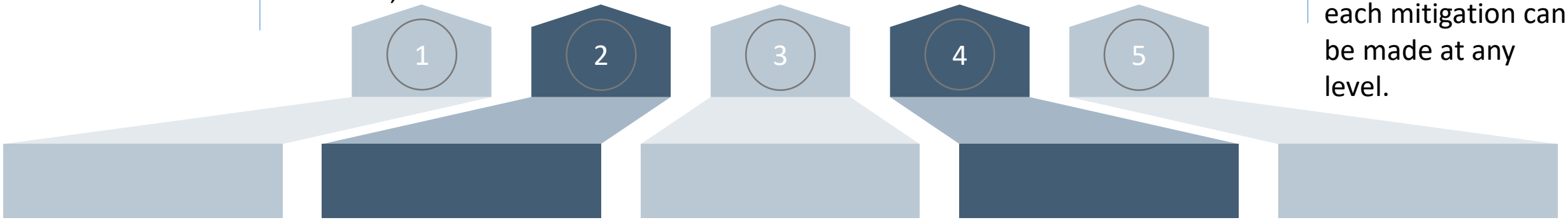
1.Risk Management starts as early as possible in a project life cycle.

2.From the EPC Contractor's point of view, the Risk management plan needs to be reviewed and updated if there are significant changes, such as changes in the organization or changes in the composition of shareholders, changes in company policies, risk attitudes, etc

3.Internal auditing provides independent assurance on the effectiveness of the risk monitoring process.

4.The risk management process must be tailored to the needs of each company, such as KKKS, which has a different approach compared with EPC contractors and FEED Contractors.

5. There will always be risks, and every organization has its own system. How much risk can be accepted? Which risks can we choose, and what mitigations are permitted? As long as there is tolerance, each mitigation can be made at any level.



International standards, best practices, and guidelines can be used as references in developing a project risk management system.

1. ISO 31000 Risk-Management
2. PMI PMBOK
3. PRINCE2®
4. ISO 9001:2015

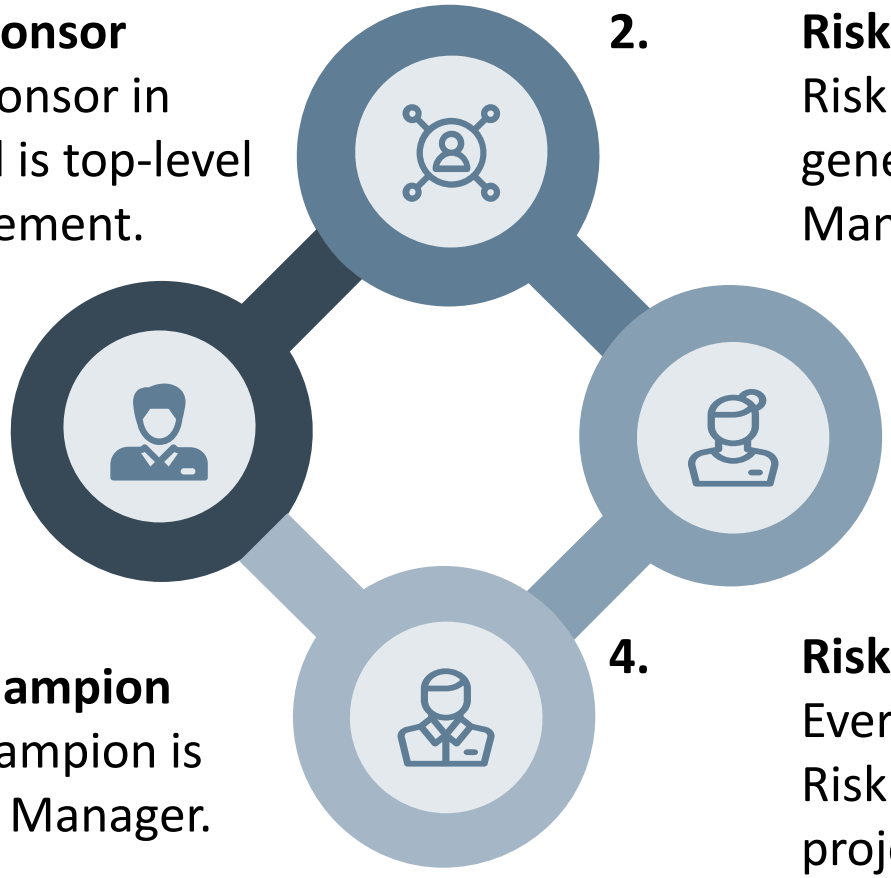
Elements and attributes in the Risk Management Plan

- Risk Strategy
- Methodology
- Roles and responsibilities
- Budget and schedule
- Risk categories
- Risk probability and impact
- Timing
- Risk documentation and Reporting

Organizational structure of the Risk Management Team of a project

1. **Risk Sponsor**
Risk Sponsor in general is top-level management.

2. **Risk Manager**
Risk manager in general is Risk Manager.



3. **Risk Champion**
Risk champion is Project Manager.

4. **Risk Owner**
Everyone can be a Risk owner on the project team.

- The project manager (PM) is responsible for risk management, and the risk manager is responsible for assurance of risk management implementation. And It is expected that all risk owners are responsible for risk management.
- Top management is involved in the company's risk management process, especially from an economic perspective and for some risks where the PM can no longer make decisions, such

Risk Budgeting

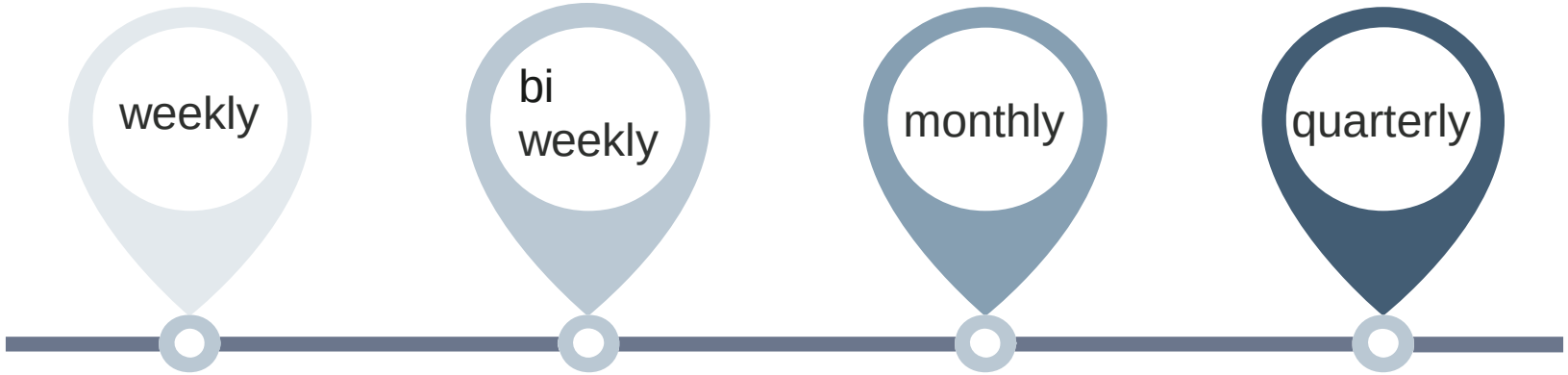
Risk budgeting has been prepared since the beginning of the preparation of the risk management plan, and the person in charge (the project owner or contractor) has been determined.

Currently, most of the EPC contract does not clearly define responsibility of risk budget, whether it is the project owner's or the contractor's.

Incorporate risk analysis into AFE so that risk information between EPC contractors, KKKS and SKK Migas is clear to allocate risk in AFE. It is expected that risks can be defined in AFE to manage the impact arising from these risks (especially on the cost aspect).

Adding risk assessment as mandatory requirement in the scope of contract work. It is necessary to anticipate schedule delays and identify risks earlier at each stage.

Timing of project risk review



Risk register updates are carried out regularly, depending on the needs of the project and the organization.

- Risk management must be implemented by mitigating early, starting from the tender phase.
- The Risk Management Plan needs to be reviewed and updated periodically.
- The risk management plan needs to be aligned with management expectations. In actuality, Risk Management needs to be tailored.
- The risk management plan needs to be audited to evaluate the management plan for the risks faced by a project.
- The Risk Management Plan needs to be completed and updated at each stage of the project, from pre-FEED to FEED and EPC, before proceeding to the next stage. If the previous stage has not been completed or finalized, it will raise risks and affect the next stage.

What challenges are faced in preparing the Risk Management Plan and how can they be overcome?

a. One of the important factors that must be considered in planning risk management is personnel knowledge, skills, competence, and experience in handling project risk management.

b. Distinguishing risks, issues, or problems and determining who is responsible if the risks are included in the tender document, which then impacts the commercial contract.

c. The risk context has two components, namely risk attitude and organizational risk appetite, which will influence how risks arise and how they can be managed and establish the criteria on which to base risk assessment.

Standard tools and techniques often used by Contractors in identifying project risks

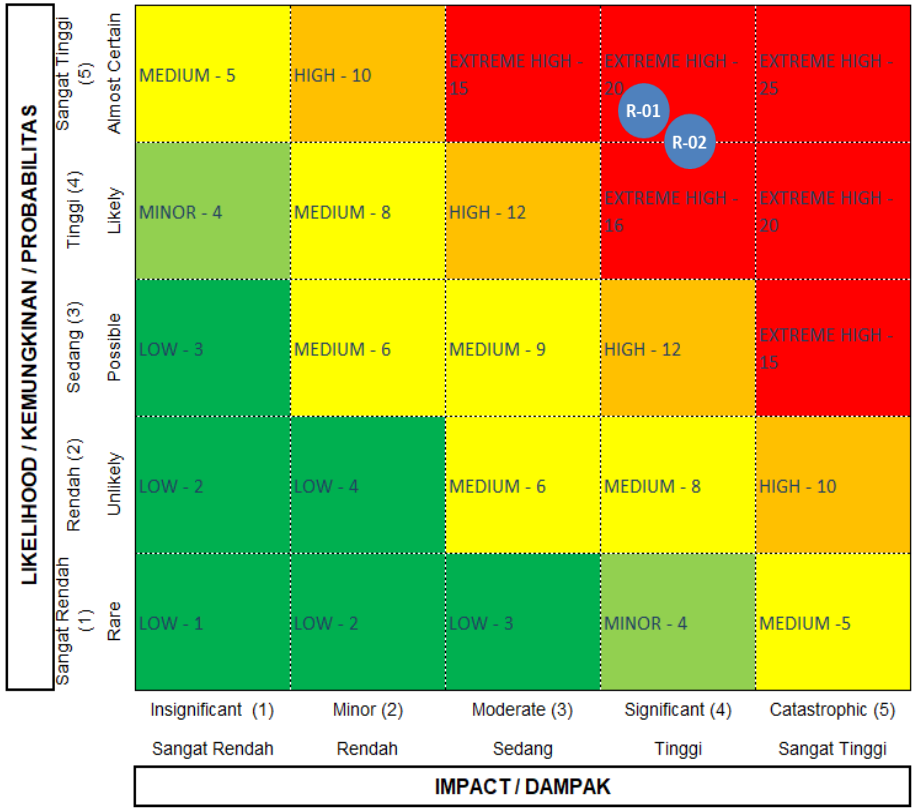
1. Brainstorming
2. Expert judgment/ Delphi technique
3. Root cause analysis
4. Interviews
5. SWOT analysis
6. Bow-tie analysis method
7. Risk workshops.

Standard form of a risk register (1)

No.	Objective / Tujuan Sasaran	Proses Bisnis	Risk Catagory/ Jenis Kelompok Resiko	Kode Resiko	Risk Event/ Uraian Peristiwa Resiko	Risk Cause/ Penyebab Resiko	Sumber Resiko (Internal/ Eksternal)	Severity/ Akibat/ Potensi Kerugian	Risk Owner/ Pemilik Resiko	Nama Dept./ Unit Internal Terkait Penyebab Resiko

No.	Kode Resiko	Risk Event/ Uraian Peristiwa Resiko	Score/ Nilai			Existing Control/ Pengendalian yang ada			Score/ Nilai Residual Risk		
			Inherent Risk								
			Likelihood	Impact	Level of Risk/ Tingkat Resiko	Ada/ Tidak Ada	Uraian	Memadai/ Belum Memadai	Likelihood	Impact	Level of Risk/ Tingkat Resiko

Risk Analysis Matrix



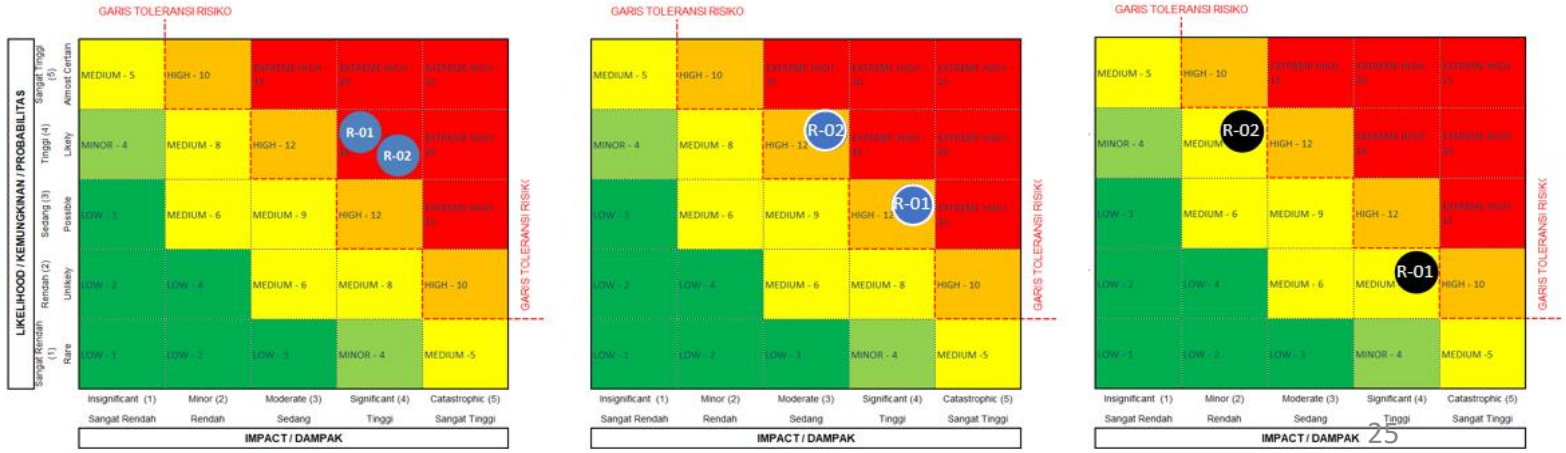
Standard form of a risk register (2)

Level of Likelihood	Descriptor	Description	Probability of Occurrence in Next 10 Years
5	**Almost certain**	Is expected to occur in most circumstances	>90%
4	**Likely**	Will probably occur in most circumstances	71-90%
3	**Possible**	Will probably occur at some time	31-70%
2	**Unlikely**	Could occur at some time	10-30%
1	**Rare**	May only occur in exceptional circumstances	<10%

	IMPACT				
	1 = Insignificant	2 = Minor	3 = Moderate	4 = Significant	5 = Catastrophic
FINANCIAL IMPACT	No Net Income Impact	< One month's net income	One month's net income ≤ x < one quarter's net income	One quarter's net income ≤ x < one year's net income	≥ One year net income
REPUTATION IMPACT	No reputational impact	Internal Impact	Local Impact	Regional Impact	National Wide Impact
HEALTH & SAFETY	No health & safety impact	Minor injuries	Major injuries to one person	Major injuries to several people	Employee or public death

Risk Treatment					Score/ Nilai Target Risk After Mitigation		
No.	Kode Resiko	Risk Event/ Uraian Peristiwa Resiko	Opsi Perlakuan Resiko	Deskripsi Tindakan Mitigasi	Likelihood	Impact	Level of Risk/ Tingkat Resiko

Inherent → Residual → After Mitigation



Standard Form of Problem List or Issue/Problem Register

- The Issue register, or Problem list, is a project document in which all issues that negatively impact the project are recorded and tracked. To list the problems, the project manager can create a spreadsheet like the following:

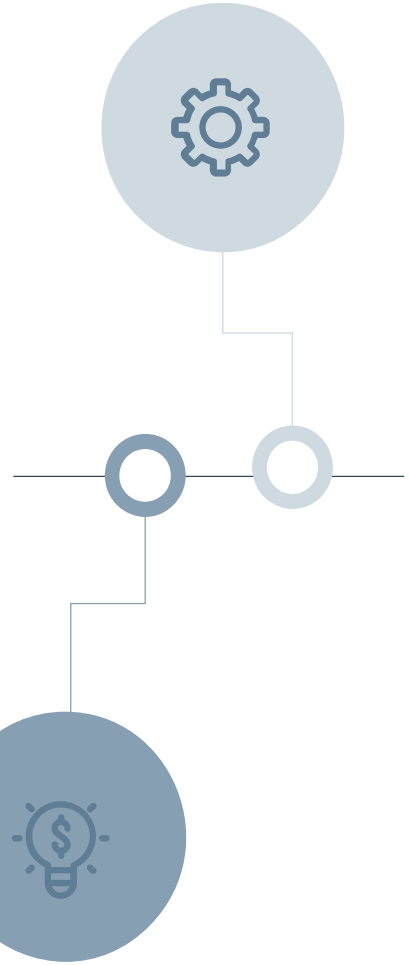
ISSUE MANAGEMENT LOG

Project Name:	
Project Manager Name:	
Project Ref:	

ID	Status	Priority	Issue Description	Owner	Estimated Resolution Date	Escalation Needed (Y/N)?	Impact	Actions	Date Identified	Logged By	Actual Resolution/ Completion Date	Final Resolution & Follow-on actions
001	Open	Critical	Issues raised by board members about the business case are preventing the project moving out of the initiation stage			Yes	Potential project cancellation or significant delay	Meet with board members to review the business case and revise the investment appraisal if needed		John Doe		The project sponsor reviewed the investment appraisal and presented the businessd case with revisions. The board approved on 12/07.

Risk Breakdown Structure (1)

Some companies already have standard risk categories that can help identify project risks. Risk category tools are generally made in spreadsheet form using MS Excel.



For those who do not have a standard risk category, they can use the RBS (Risk Breakdown Structure) to describe the various potential risks in a project. There are four main types of project risk: technical, external, organizational, and project management, as shown in Table below.

Risk Breakdown Structure (2)

RiBS LEVEL 0	RiBS LEVEL 1	RiBS LEVEL 2
0. IMPACT ON PROJECT	1. TIME IMPACT	1.1 Project duration
		1.2 Phasing
		1.3 Interim milestones
		1.4 Float
		1.5 Delivery schedule
		1.6 Useful product life
		1.7 Obsolescence
	2. COST IMPACT	2.1 Profitability
		2.2 Margin
		2.3 Cashflow
		2.4 Resourcing
		2.5 NPV
		2.6 ROI
		2.7 Whole-life costs
		2.8 Cost of ownership
		2.9 Liquidated damages
		2.10 Contingency reserve
		2.11 Payback period
	3. SCOPE/QUALITY IMPACT	3.1 Performance
		3.2 Functionality
		3.3 Reliability
		3.4 Maintainability
		3.5 Expansion potential
		3.6 Security
	4. IMPACT ON OTHER OBJECTIVES	4.1 Safety
		4.2 Regulatory compliance
		4.3 Reputation
		4.4 Supply chain
		4.5 Business case
		4.6 ...

RBS LEVEL 0	RBS LEVEL 1	RBS LEVEL 2
0. PROJECT RISK	1. TECHNICAL RISK	1.1 Scope definition
		1.2 Requirements definition
		1.3 Estimates, assumptions & constraints
		1.4 Technical processes
		1.5 Technology
		1.6 Technical interfaces
		1.7 Design
		1.8 Performance
		1.9 Reliability & maintainability
		1.10 Safety
		1.11 Security
		1.12 Test & acceptance
	2. MANAGEMENT RISK	2.1 Project management
		2.2 Programme/portfolio management
		2.3 Operations management
		2.4 Organisation
		2.5 Resourcing
		2.6 Communication
		2.7 Information
		2.8 HS&E
		2.9 Quality
		2.10 Reputation
	3. COMMERCIAL RISK	3.1 Contractual terms & conditions
		3.2 Internal procurement
		3.3 Suppliers & vendors
		3.4 Subcontracts
		3.5 Client/customer stability
		3.6 Partnerships & joint ventures
	4. EXTERNAL RISK	4.1 Legislation
		4.2 Exchange rates
		4.3 Site/facilities
		4.4 Environmental/weather
		4.5 Competition
		4.6 Regulatory
		4.7 Political
		4.8 Country
		4.9 Social/demographic
		4.10 Pressure groups
		4.11 Force majeure

Constraints in the identification process and risk categories up to the creation of a risk register.

a. Lack of experience in identifying and categorizing risks

b. Information that is not transparent

c. Lack of tools such as RBS

The process of identifying risks and risk categories is difficult to carry out within a company or organization

Tools and techniques for conducting project risk analysis (qualitative and/or quantitative)

The most frequently applied Risk Analysis tools and techniques in project management are as follows:

- **Qualitative Analysis**
  a. Brainstorming
  b. Expert Judgement
  c. Delphi Technique
  d. Probability/Impact Matrix

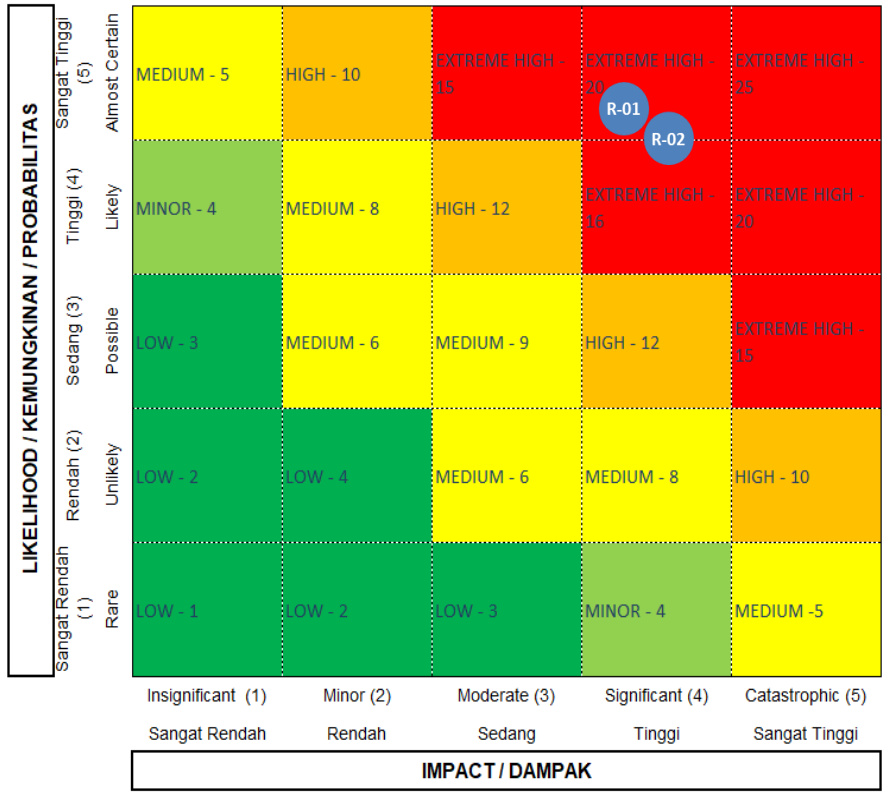
- **Quantitative Analysis**
  a. Decision Tree Analysis
  b. Sensitivity Analysis
  c. Monte Carlo Simulation
  d. Bow-tie Analysis
  e. Define Contingency

Defining Risk, Probability, Impact Criteria and Developing a Risk Matrix

In general, typically both KKKS and EPC Contractors define probability and risk impact criteria at five levels. The criteria for each company can vary depending on its risk attitude.

The P (probability) vs I (Impact) Risk Matrix used is the 5 x 5 Risk matrix.

Risk Analysis Matrix



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Risk prioritization methods and knowing the Significant risks that most often occur in a project

- The risk prioritization method is carried out by conducting a gradual risk analysis of the risk register and taking into account the impact and cost mitigation.
- Contractors must be consistent in prioritizing risks with output in the form of the Top 10 Risks in each progress report to get the attention of stakeholders.
- Many contractors have not been consistent in tracking or monitoring the risk priority status on a regular basis.

MONTHLY TOP RISKS RANKING				
Risk Event	**Rank This Month**	**Rank Last Month**	**Number of Months in Top Ten**	**Risk Resolution Progress**
Inadequate planning	**1**	2	4	Working on revising the entire project management plan
Poor definition	2	3	3	Holding meetings with project customer and sponsor to clarify scope
Absence of leadership	3	**1**	2	After previous project manager quit, assigned a new one to lead the project
Poor cost estimates	4	4	3	Revising cost estimates
Poor time estimates	5	5	3	Revising schedule estimates

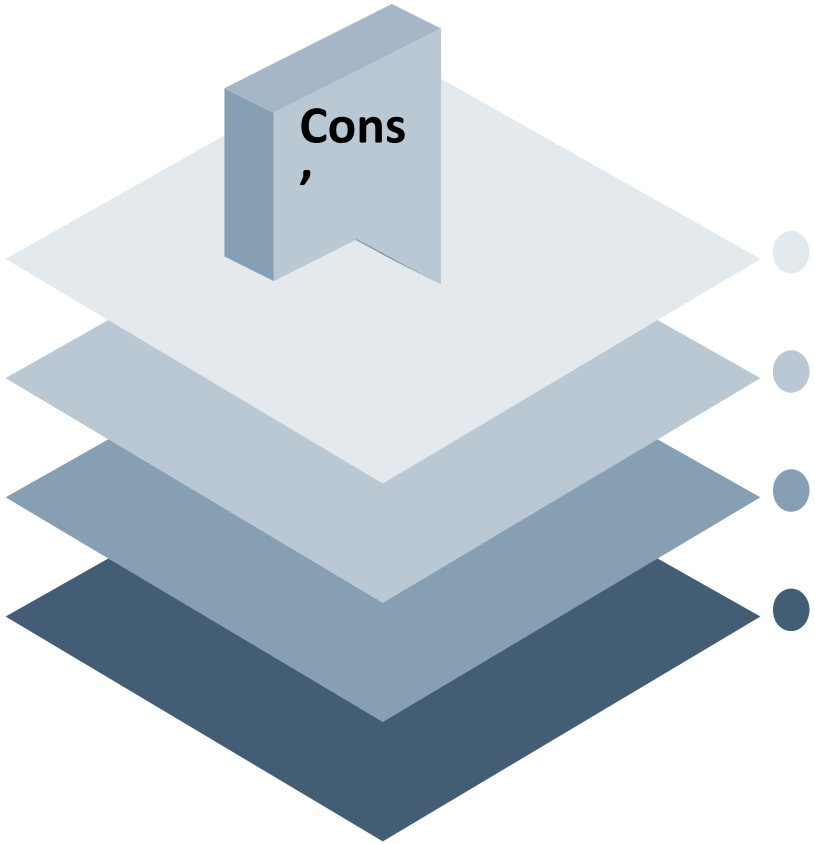
Capture Risk Response Plans or Action Plans, including those for solving issues or problems.

Risk Action Plans are actions that organizations agree to take to help them address potential project risks. reduce the probability and impact of the risk if it does occur. Table below provides examples of risks or issues that often occur in onshore and offshore projects, complete with a Risk Response Plan or Action Plan to anticipate if risks do occur in onshore and offshore projects.

Common risk & issue (risk respon)			
Offshore		Onshore	
Issue	Action Plan	Issue	Action Plan
delivery major equipment	(Company LII)	Man power readiness	(dipastikan dalam kontrak)
availability installation vessel	(dipastikan diikat dalam kontrak)	Social and formalities	(koordinasi dengan stakeholder, komunikasi)
Man power readiness	(dipastikan dalam kontrak)	Covid-19 Pandemic	(penerapan prokes yg ketat)
Covid-19 Pandemic	(penerapan prokes yg ketat)	personal replacement / key person	(memastikan key person)
data availability (g & g)	(memastikan data yg digunakan data yg sama dengan lokasi)	Lokal Community issue	(diambil sebagai opportunity,empowering stakeholder)
as-built tidak update	(mengupdate as-built secara inhouse)	as-built tidak update	(mengupdate as-built secara inhouse)
Over confident	Stakeholder management	Permit	(stakeholder mngt, komunikasi)

Obstacles in Risk Analysis and Prioritization and how to overcome them

Constraints in risk analysis : Contractors often experience as follow,



- Sufficient time is not available to complete the project risk analysis
- Differences in point of view between KKKS and their contractors in understanding the context of risk, definitions, and important terms regarding what is considered risk.
- Bias due to inaccurate information can cause the Risk Assessment to fail.
- The new project area creates very little information that will ultimately affect the quality of the risk assessment results.

The way to overcome this is to develop a common taxonomy, framework, and risk dictionary, RBS (Risk Breakdown Structure).

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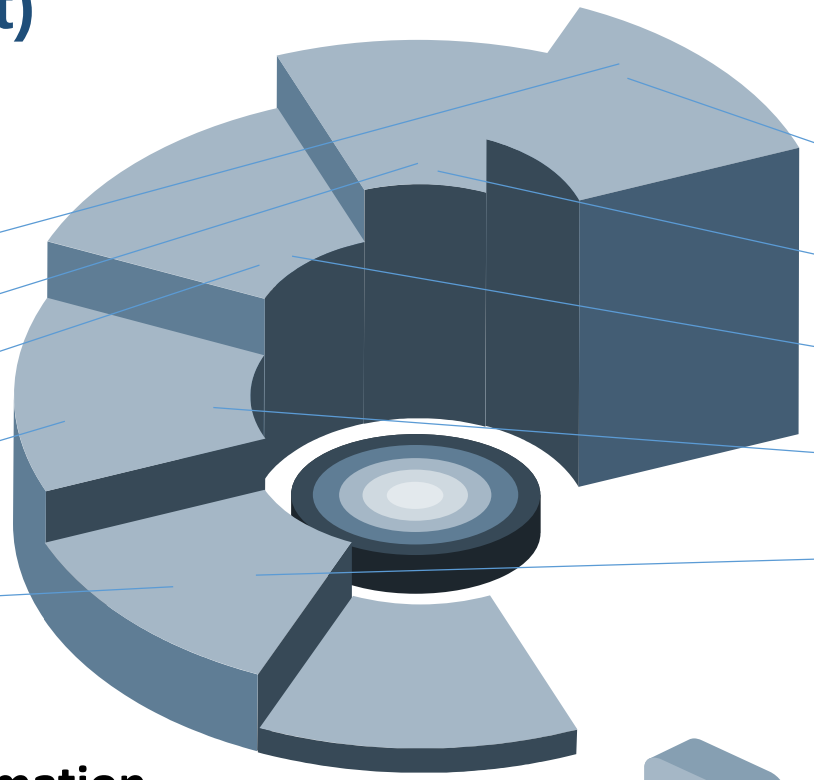
Risk Response Strategy Options, Both for Positive Risk (Opportunity) and Negative Risk (Threat)

Positive Risk (Opportunity) response strategy options:

1)Escalates
2)Enhance
3)Exploits
4)Accept
5) Shares



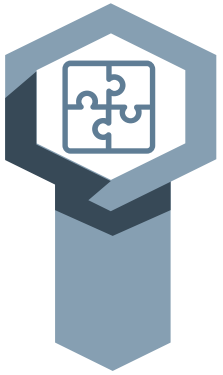
Negative Risk (Threat) response strategy options:

1)Escalates
2) Mitigate
3)Transfers
4)Avoid
5)Accept

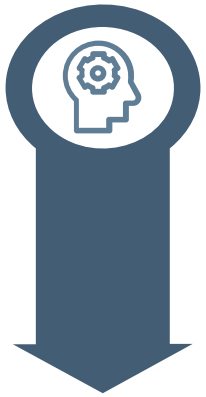
Understanding and information
it should enable stakeholders to make informed conclusions about how the decision will impact their interests and values.

Risk Communication
is an important tool for disseminating information and understanding about risk management decisions.

Managing Project Risks and Issues - Risk Monitoring (1)



- Risk monitoring and review need to be carried out periodically so that management can act quickly if a risk turns out to be beyond acceptable limits.



- Some project managers monitor risks with their team in project monitoring meetings that are held regularly, for example, Weekly or biweekly.

- Referring to PMBOK, Tools and Techniques for Risk Monitoring are: Risk Reassessment, Risk Audit, Analysis of Variances and Trends using project performance data, Measurement of project technical performance (actual vs. planned), Analysis of reserves: the amount of contingent reserves remaining vs. the amount of risk remaining each while on the project, Progress monitoring meetings are held periodically.

Managing Project Risks and Issues - Risk Monitoring (2)

No.	Kode Resiko	Risk Event/ Uraian Peristiwa Resiko	Deskripsi Tindakan Mitigasi	Waktu Pelaksanaan Rencana Mitigasi & Realisasi Mitigasi Tahun 2023												Evidence	PIC/ Risk Owner
				Triwulan I			Triwulan II			Triwulan III			Triwulan IV				
				Jan	Feb	Mar	Apr	Mei	Jun	Jul	Ags	Sep	Okt	Nov	Des		

3. Problem and Typical Risk in EPC Project

Problem and Typical Risk (Project Classification)

Focus

	Small & medium projects	Megaprojects	'Ultra-large projects'
			
	▪ <US$1 billion ▪ <2 year execution ▪ Proven technology ▪ Frequent for company ▪ Asset manager decisions	▪ >US$1 billion+ ▪ 2-3 years execution ▪ Proven technology ▪ Experienced contractor available on the market ▪ VP projects decisions	▪ >US$5 billion ▪ 5+ years execution ▪ May have new technology ▪ Infrequent for the company / owner ▪ Complex stakeholder management ▪ CEO / board level decisions ▪ Can introduce changes to the market / environment
Examples	Major equipment upgrade	Asset expansion Constructing a new unit	Major greenfield project (e.g. new mine, LNG facility, O&G field, infrastructure program)

Problem and Typical Risk (Historical Mega Project Performance)

Historical performance for projects with budgets >US$1 billion

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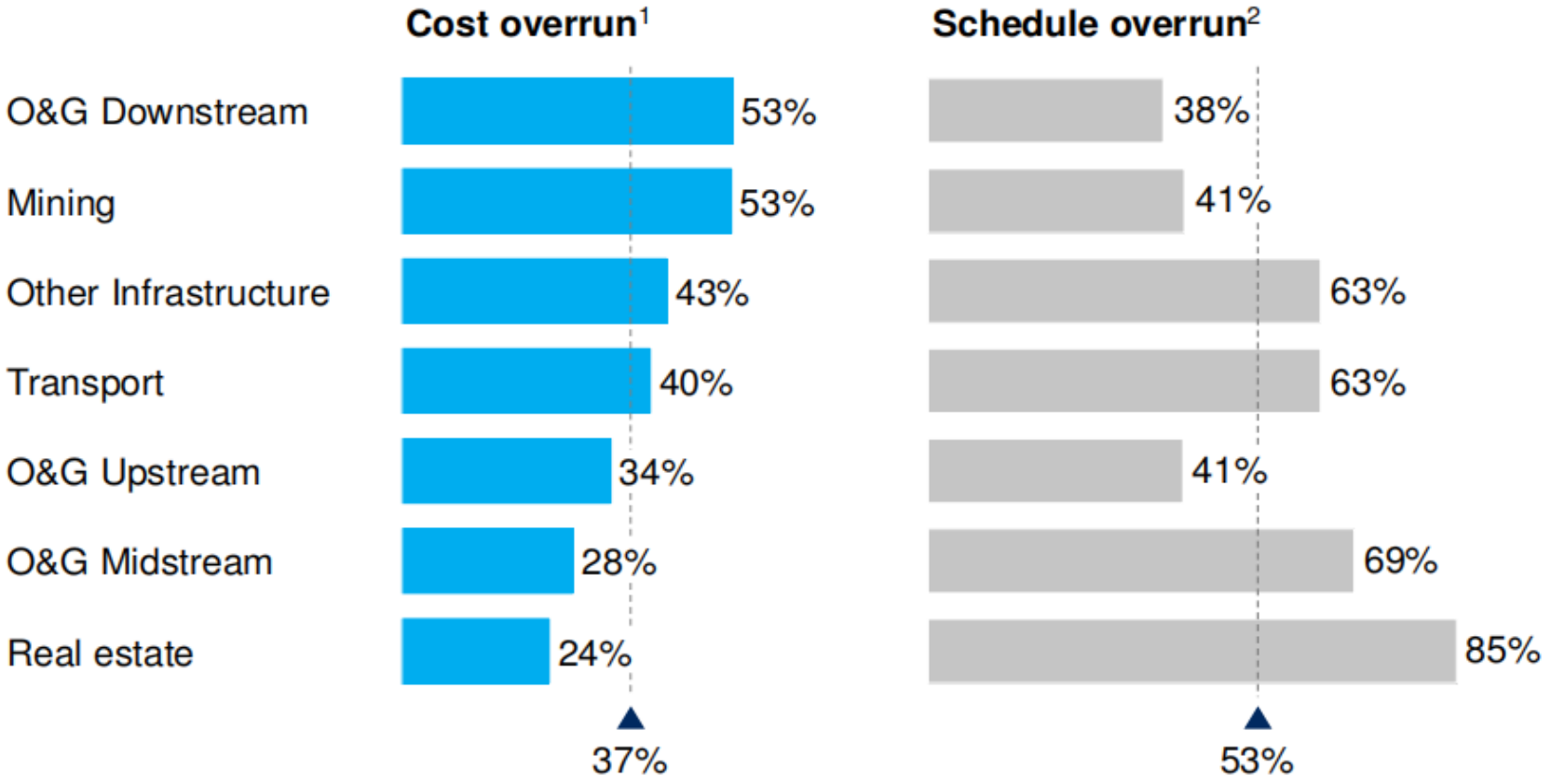

If this performance continues, we will see a further US$5 trillion loss on the 3600+ currently planned megaprojects[3]

1 Cost overrun = (actual cost – budgeted costs) / budgeted cost
2 Schedule overrun = delivery delay / budget duration
3 Excludes consideration of broader economic impact of late projects

SOURCE: IHS Herold Global Projects Database (2017), Basic Materials Database (2012), Megaprojects Database (2015)

Problem and Typical Risk (Identify EPC Project Risk)

Project Scope
- Client adds or changes scope
- Work cannot be accurately defined
- Scope is under-estimated
- Project Objectives change

Project Schedule
- Duration under-estimated
- End date shifts in project
- Project approvals late
- Management review delays

Marketing
- Unrealistic user expectations
- Market requirements change
- Price points change
- Sales volume goes down
- Sales volume goes up

Material
- Source(s) & availability
- Poor integration with existing
- Poor supplier relaibility
- Poor material availability
- High Prices
- Poor quality'

Facilities & Equipment
- Poor reliability
- Availability problems
- Incompatibilities
- Competing users
- proprietory limitations
- Poor flexibility/ adaptability
- location
- Space limitations

Resources
- Team changes
- Funding shifts, changes
- Uncertain costs
- Misaligned priorities
- Unavailability or limits

Organisational
- Unclear roles & responsibilities
- poor management
- Poor communication
- Turf Wars
- Lack of co-ordination
- Policy limitations
- Re-organisational issues

Personal
- Vacations/ illnesses
- Family/ other issues
- Conflicting interests
- Outside distractions
- Ethics issues
- Moral issues
- Restrictions- culture, religion etc

People
- Performace, productivity
- Interpersonal conflict
- Poor motivation/ attitude
- Poor skills fit
- Development 7 growth issues
- Health & Safety issues
- Diversity issues

External Influences
- Weather, natural disasters
- Govt. regulations
- heath & Safety
- Patent, copyright
- Cultureal issues
- Political issues
- Economic
- PR
- Legal

How to Identify Risk
1. Understanding Scope
2. Work Breakdown Structure
3. Risk Breakdown Structure
4. Follow the Process
5. Roundtable Discussion
6. Root Cause Analysis
7. Risk Register
8. Internalized Risk

Problem and Typical Risk (Typical Scope & Schedule Project Risk)

Typical Schedule Project Risk

Risk Identification

- Period of Completion
- Delay Approval
- Long Lead Item
- Working Calendar Days
- Project Milestone

Risk Response

- Master Schedule
- Coordination with Other Parties

Typical Scope Project Risk

Risk Identification

- Scope of Work
- Scope of Capabilities
- Split of Responsibility
- Battery Limit
- Liability

Risk Response

- Scope Verification
- Contractual Statement

Problem and Typical Risk (Typical EPC Contract Project Risk)

Risk Identification

- Contract Scheme and parties involved
- Joint & Severally
- Signing Contract & Effective Date
- Order of Precedence
- Guarantee & Warranty
- Penalty & Liability
- Choice of Law & Arbitration

Risk Response

- Balance & Fair
- Covering All Risk
- Understanding All Clauses
- Commitment

Typical Contract Project Risk

- Force majeure (cover risk: act of God, war etc)
- Indemnity (protect one or more party)
- Liens (release other party from claim)
- Variation (cover in the event change)
- Insurance (cover accident, damage & loss)
- Time Extensions (clause if have to be delay)
- Liquidated damages (to prevent delay)
- Consequential damages (prevent claim if loss)
- Suspension of work (prevent unpredictable event)
- Default (prevent if other party fault)
- Termination (prevent unpredictable event)
- Warranties (make sure to other party)

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Problem and Typical Risk (Suggested Risk Sharing Related to Contract Type vs Risk Spectrum)

Scope of work information	Very Little		Partial		Complete
Uncertainty	High		Moderate		Low
Degree of risk	High		Medium		Low
Suggested risk allocation	100% Owner (client)				0% contractor
Contract Types	CPPF	CPIF	CPFF	FPIF	FFP

- **CPPF** : Cost Plus Percentage Fee
- **CPIF** : Cost Plus Incentive Fee
- **CPFF** : Cost Plus Fixed Fee
- **FPIF** : Fixed Price Incentive Fee
- **FFP** : Firm Fixed Price

"At the end of the day, no matter what your contracting strategy is and how you plan to allocate the risks, the ultimate risk owner is the owner. If the project is not ready, is over budget, or doesn't start, it is the owner's problem." Lester Belanger

"There is a tendency which is seductively simple—to think that the less you know, the more you're going to rely on an EPC-type contract." Grant King

Know the limitations of a contracting mechanism. Contracts should be seen as a tool for formalising understanding, not driving execution. Risks are best managed when owners and contractors work together to execute in the best interests of the project, rather than focusing on claims management and abiding rigidly to contract terms. We emphasise that projects are not delivered by legal teams defending contractual positions.

Successful owners thoughtfully delegate only those risks that the contractor is better positioned to manage. Leaders should establish and maintain relationships, not only contracts, to facilitate ongoing alignment of incentives.

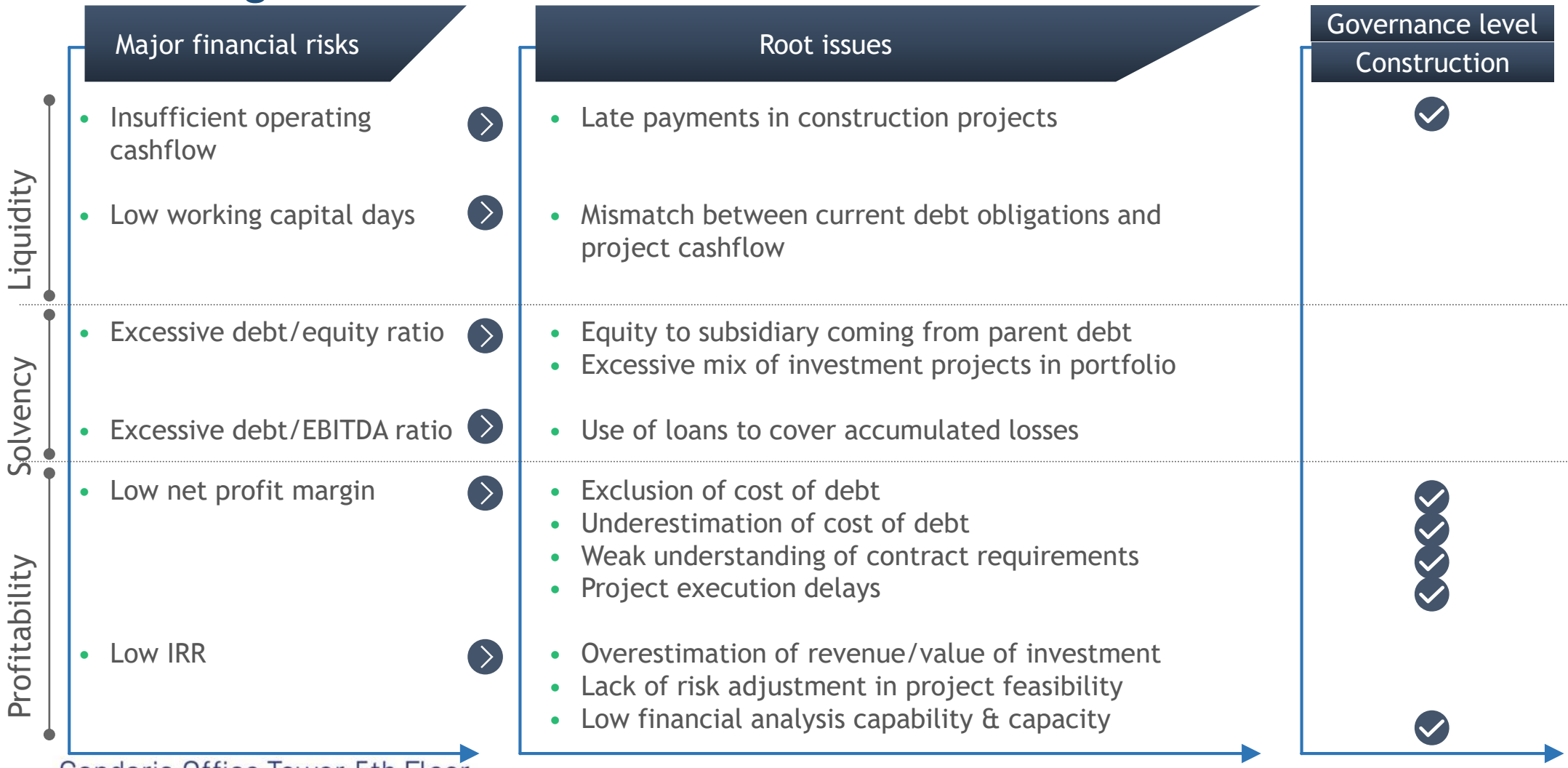
Problem and Typical Risk (Strategy to respond typical major EPC Project Risk)

1. Internalized Risk Register
2. Concern from All Member Project Team
3. Mitigate at the Earliest Phase
4. Fast Decision
5. Minimize Respond with Contingencies
6. Allocate Risk in the Contract
7. Transfer Risk to Other parties
8. Cover by Insurance
9. Risk Monitoring & Control

Typical Major EPC Project Risk

1. Price of Material
2. Bill of Quantity
3. Oil Price
4. Currency
5. Inflation
6. Rework
7. Local disturbance

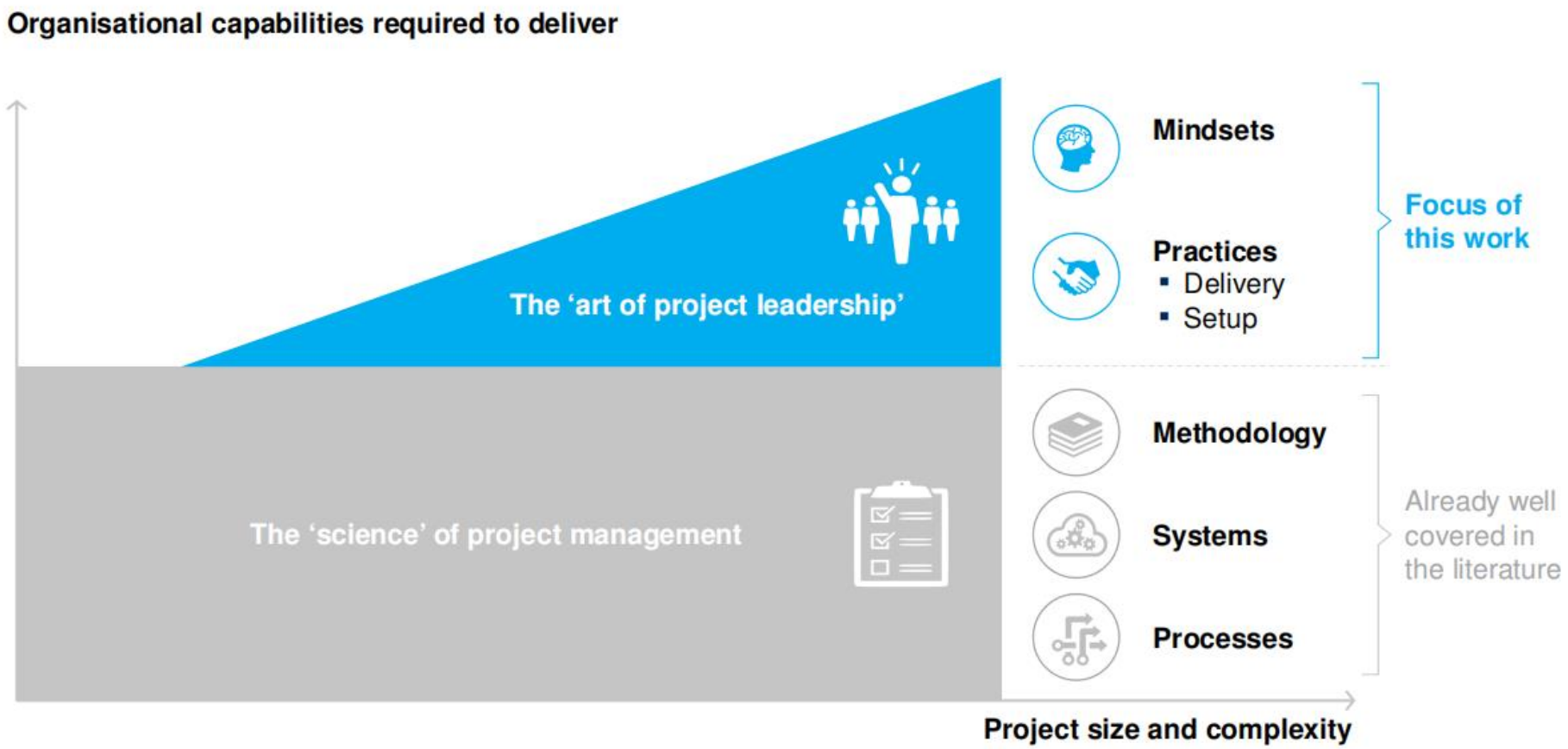
Problem and Typical Risk Project Risk Affecting Financial Issues



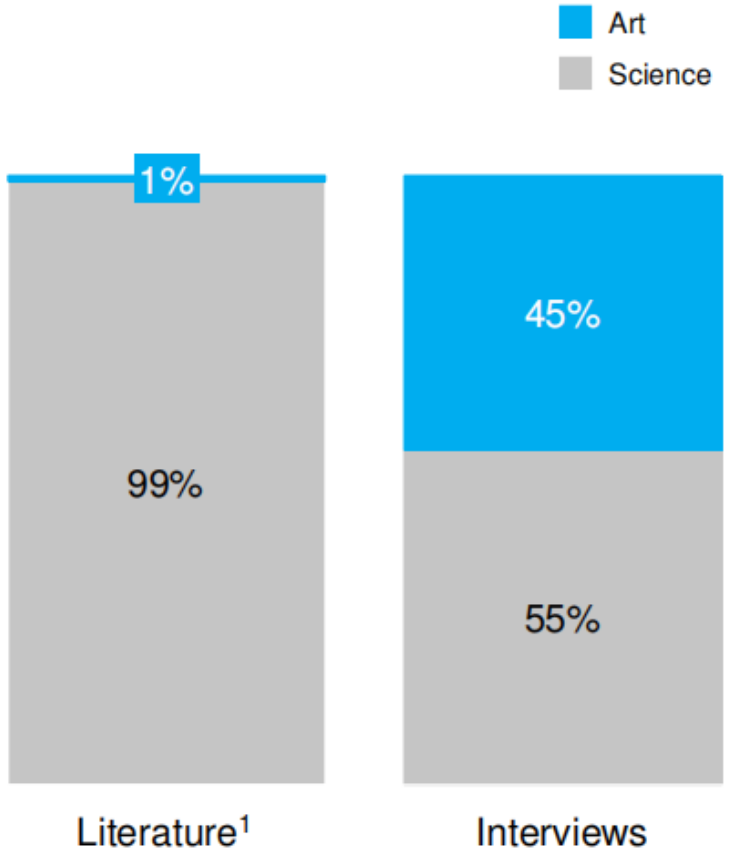
4. Mitigation Strategies & Recommendation

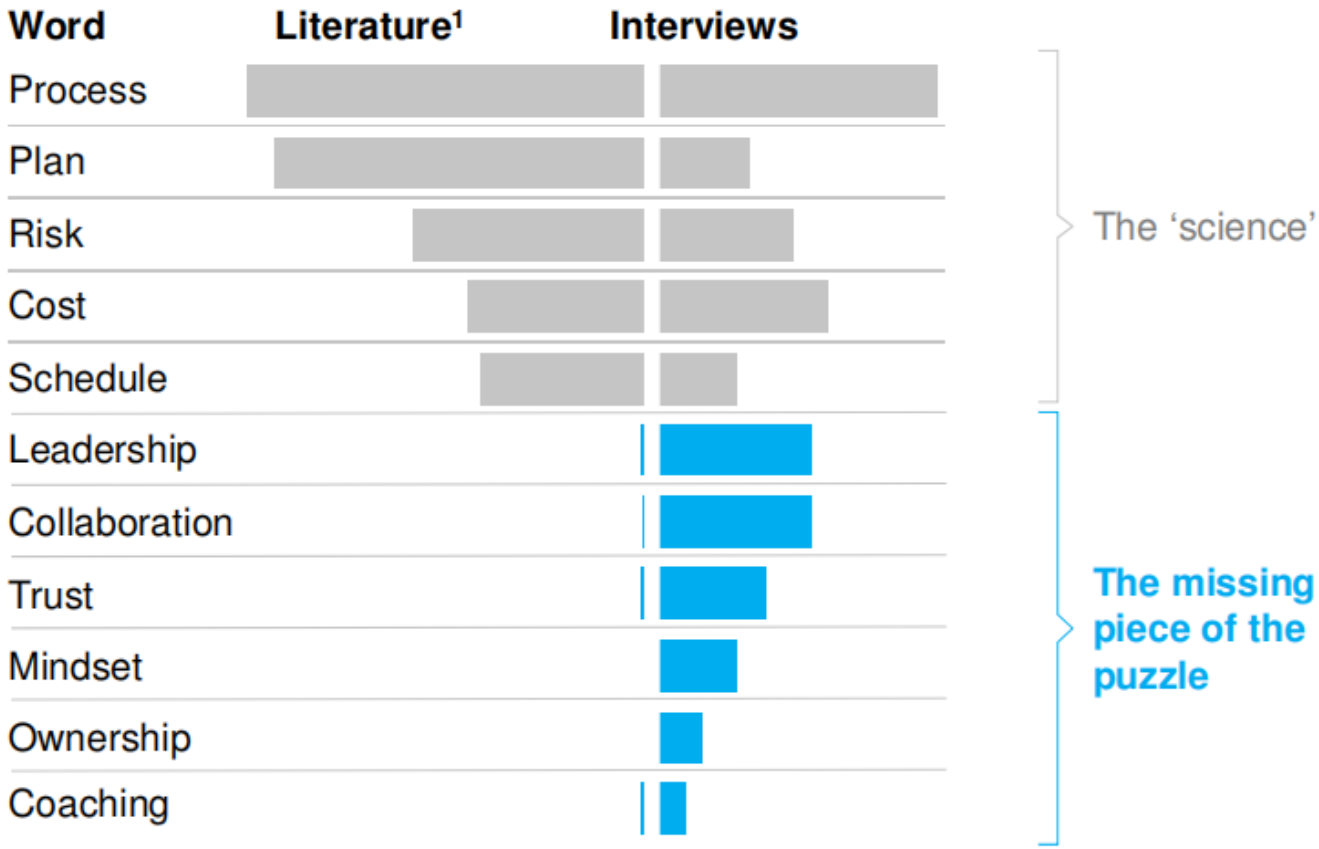
Recommendation (Art of Project Leadership)

EXHIBIT 6: THE "ART OF PROJECT LEADERSHIP" GAINS IMPORTANCE WITH INCREASING PROJECT SIZE AND COMPLEXITY.



Recommendation (Science vs Art Project Management)





1 Based on PMBOK (Project Management Body of Knowledge)

SOURCE: PMBOK Guide 2013, interviews

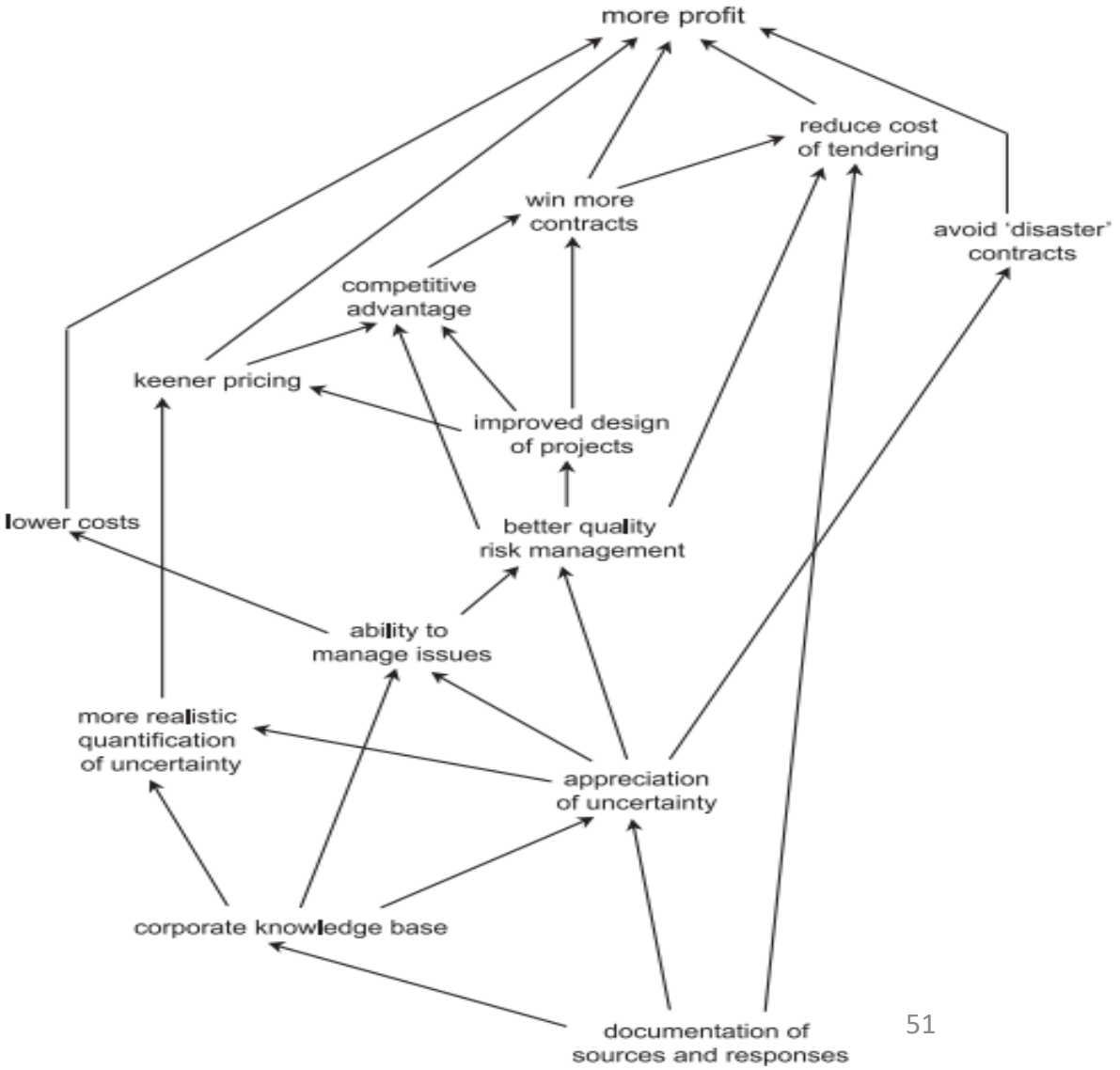
Recommendation- Roles for Risk Analysis Throughout Project Life Cycle (PLC)

stages of the PLC	*roles for risk analysis*
conceive the product	identifying stakeholders and their expectations identifying appropriate performance objectives
design the product strategically	testing the reliability of design testing the feasibility of design setting performance criteria assessing the likely cost of a design assessing the likely benefits from a design assessing the effect of changes to a design
plan execution strategically	identifying and allowing for regulatory constraints assessing the feasibility of a plan assessing the likely duration of a plan assessing the likely cost of a plan determining appropriate milestones estimating resources required at a strategic level assessing the effect of changes to the plan determining appropriate levels of contingency funds and resources assessment of contracting strategy at an overview level
allocate resources tactically	estimating resources required at a more detailed level assessment of contracting strategy at a more detailed level evaluating alternative procurement strategies defining contractual terms and conditions determining appropriate risk-sharing arrangements assessing the implications of contract conditions assessing and comparing competitive tenders determining appropriate target costs and bid prices for contracts estimating likely profit following project termination
execute production	identify remaining execution issues assessing implications of changes to design or plan revising estimates of cost on completion revising estimates of the completion time of the execution stage
deliver the product	identifying issues impacting delivery assessing the feasibility of a delivery schedule assessing the feasibility of meeting performance criteria assessing the reliability of testing equipment assessing a requirement for resources to modify a product assessing the availability of commissioning facilities
review the process	assessing the effectiveness of risk management strategies identifying realized sources and effective responses
support the product	identifying the extent of future liabilities assessing appropriate levels of resources required assessing the profitability of the project

Recommendation- Corporate benefits implementing Risk Management Process

Corporate benefits that the application of Risk Management Process for all projects might bring in a contractor organization. Assuming a contractor organization undertakes risk management prior to and after tendering, then a number of interrelated benefits can accrue, all driving up profitability, through lower level benefits such as:

- keener pricing, better design, and stronger risk management abilities provide competitive advantage and improve chances of winning contracts;
- better appreciation of uncertainty means more realistic pricing and the avoidance of potential loss-making 'disaster' contracts where uncertainty is too great;
- ability to manage risks means lower project costs with direct profit implications;
- reduced tendering costs mean higher profits.



Recommendation- Key principles Risk Management in Leading Company

Dedicated risk team at project level

- Risk manager facilitate end-to-end risk management process and collaboration across project function
- One risk manager may oversee 2-3 projects, except for large and complex project (typically value >1.5Bn USD) needs to have a dedicated risk manager
- Project manager and team holds full responsibility and ownership of the risk management, PM should include proactive risk identification

Robust & continuous risk review

- Embed risk management practices throughout construction phases & process (identify and manage risk from tender to execution phases)
- Continuously refresh risk register
  - Before 40% construction completion risk review is done bi-weekly due to higher chance of risks occurrence in the beginning of the project
  - After 40%, risk review done every 2/3 months
- Risk review should also include re-evaluation of risk register and action plan

Recommendation-
Principles translated into key activities

Activities	Target
Identify & assess project risk by PM and team **Review risk based on checklist from past- experiences**	• Able to identify risks from different aspects (e.g., quality, time, cost, safety) • Leverage risk database from similar past-experiences
Create action plan for each identified risk	• Create action plan for each risk (accept, transfer, share, reduce impact, reduce likelihood, remove) • Create detailed follow-up actions for various project stages
Review & escalate risk across different organization level	Review & escalate risk for management approval : • Joint review between project team and headquarter team • Ask for management approval (include conditional event e.g.,cost deviates >5%)
Define checkpoint for risk review & re-evaluation	Checkpoint should cover: • Regular biweekly update include updates to project team for changes in schedule and forecast (before 40% project completion) • Once every 2/3 months risk review after 40% project completion • Conditional update e.g., >1-month delay or >5% cost deviates • Quality audit once every 3 months • Risk manager facilitation (e.g., workshop) to ensure understanding of using risk register from identification to

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Recommendation- Enablers in place to support Risk management excellence

Organization requirement

Talent competency

- Dedicated risk officer at project level as facilitator
- PM competency in risk identification
- Personnel discipline and adherence to risk SOP

Technology requirement

Risk management tools to manage action required by each function,

- Risk register
- Risk assessment
- Risk action plan
- Risk tracking & evaluation
- Management review

Development activities & milestone

Develop process

- Identify gap between current procedures and best practice (internal company & global)
- Update and review risk management procedures (e.g., cadence in risk review)
- Establish dedicated risk officer at project level
- Align and get approval for changes in risk management procedures
- Implement and communicate changes in risk management procedures
- Establish regular & rigorous audit on risk procedures implementation across all projects and relevant function for risk management

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