PROJECT MANAGEMENT

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PMP® Certification Training

Lesson 13: Project Risk Management

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PROJECT MANAGEMENT

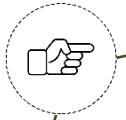
Objectives

- Define risk
- Describe the key concepts and tailoring considerations in Project Risk Management
- Learn how to calculate risk
- Identify different categories of risk
- Describe Project Risk Management processes

Risk

The definition of *Risk is as follows:

"Risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more of a project's objectives."



You are managing a gas pipeline expansion project in Canada. The project funds are allocated in US dollars even though most of the expenses are in Canadian dollars. Exchange fluctuations are a risk to the project budget. Shortly after the project starts, the Canadian dollar depreciates significantly, which contributes to a budget surplus. This is an example of a positive risk.

If a major storm delays the construction of a commercial office tower, the project timelines may be delayed. This is an example of negative risk.

*Definition taken from the Glossary of the Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide)* – Sixth Edition, Project Management Institute, Inc., 2017, Page 720

Project Risk Management

KEY CONCEPTS

Risk exists at two levels within every project:

- **Individual project risk**– It is an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives.
- **Overall project risk**– It is the effect of uncertainty on the project as a whole, arising from all sources of uncertainty including individual risks, representing the exposure of stakeholders to the implications of variations in project outcome both positive and negative.

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Project Risk Management

TRENDS AND EMERGING PRACTICES

- Non-event risks
- Project resilience
- Integrated risk management

Some of the evolving trends in Project Risk Management include:

Variability risk

Uncertainty exists about some key characteristics of a planned event or activity or decision.
Examples include over or under productivity, high or low defects, and unseasonal weather condition.

Ambiguity risk

Uncertainty exists about what might happen in the future. Imperfect knowledge in certain areas of the project, such as elements of technical solution, future developments in regulatory framework, and inherent complexity, might affect achieving the project objectives.

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Project Risk Management

TRENDS AND EMERGING PRACTICES

- Non-event risks
- Project resilience
- Integrated risk management

Emergent risks can be tackled through developing project resilience.

This requires each project to have:

- Right level of budget and schedule contingency reserve for known risk
- Flexible project processes
- Project team empowerment within agreed limits
- Clear input from stakeholders so that strategy can be adjusted to respond to emergent risk

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Project Risk Management

TRENDS AND EMERGING PRACTICES

- Non-event risks
- Project resilience
- Integrated risk management

Program-level risks will be delegated to project team, and project-level risks will be escalated to higher levels.

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Project Risk Management

TAILORING CONSIDERATIONS

Considerations for tailoring the way Project Risk Management Processes are applied:

- **Project size**—Risk process to be used is based on size of budget, duration, scope, and team size.
- **Project complexity**—Robust risk approach is needed when the project calls for innovation, new technology, and external dependency.
- **Project importance**—Level of risk for the project increases when there are breakthrough opportunities and major product innovation.
- **Development approach**—For waterfall project, risk processes can be sequential and iterative; for agile approach, the risk is addressed at the start of every iteration and during execution.

Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide)* – Sixth Edition, Project Management Institute, Inc., 2017, Page 400

Project Risk Management

AGILE/ADAPTIVE ENVIRONMENT

- Frequent reviews of incremental work product and cross-functional project teams must be done to manage risk.
- Risk identification, analysis, and management are done during each iteration of the review.
- Work may be reprioritized based on understanding of risk exposure.

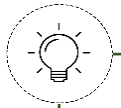
Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide)* – Sixth Edition, Project Management Institute, Inc., 2017, Page 400

Key Terms

- Negative risks are known as **threats** and positive risks are 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**.

Risk averse

One who does not take risks



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

Calculation of Risk

Risks 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.

Formula:

Risk Exposure = Risk Probability * Risk Impact

Where 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

Calculation of Risk: Example

Calculate the expected monetary value for the given work packages.

Work Package	Probability	Impact
X	25%	-$10,000
Y	40%	-$2,000
Z	10%	+$20,000

Work Package	Probability	Impact	Expected Monetary Value (EMV)
X	25%	-$10,000	-$2,500
Y	40%	-$2,000	-$800
Z	10%	+$20,000	+$2,000
		TOTAL EMV	**-$1,300**

Risk Categorization

Risks can be classified in various ways. One classification of risk is as follows:

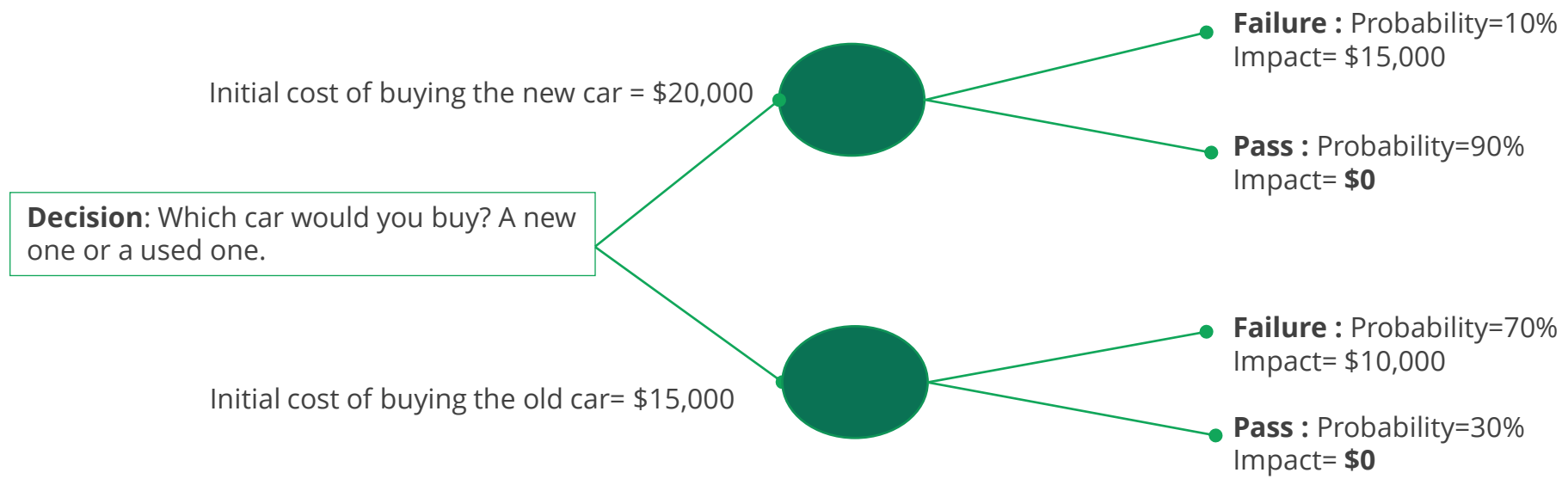
External Risks	• Arise out of external factors, for example, regulatory or governmental policies, subcontractors, suppliers, environment, etc.
Internal Risks	• Arise within the project, for example, funding, resources, prioritization, etc.
Technical Risks	• Arise out of the technology being used, for example, requirements, technology, quality, etc.
Project Management Risks	• Arise out of project management activities, for example, estimating, planning, schedule, communication, etc.

! Risks can also be classified on the basis of their origin: scope risks, resource risks, schedule risks, cost risks, and quality risks.

Decision Tree

A decision tree is used to analyze risk and its impact on decisions in the face of uncertainties.

If you need to buy a car, which one would you buy? Which option has a risk over a period of 5 years?



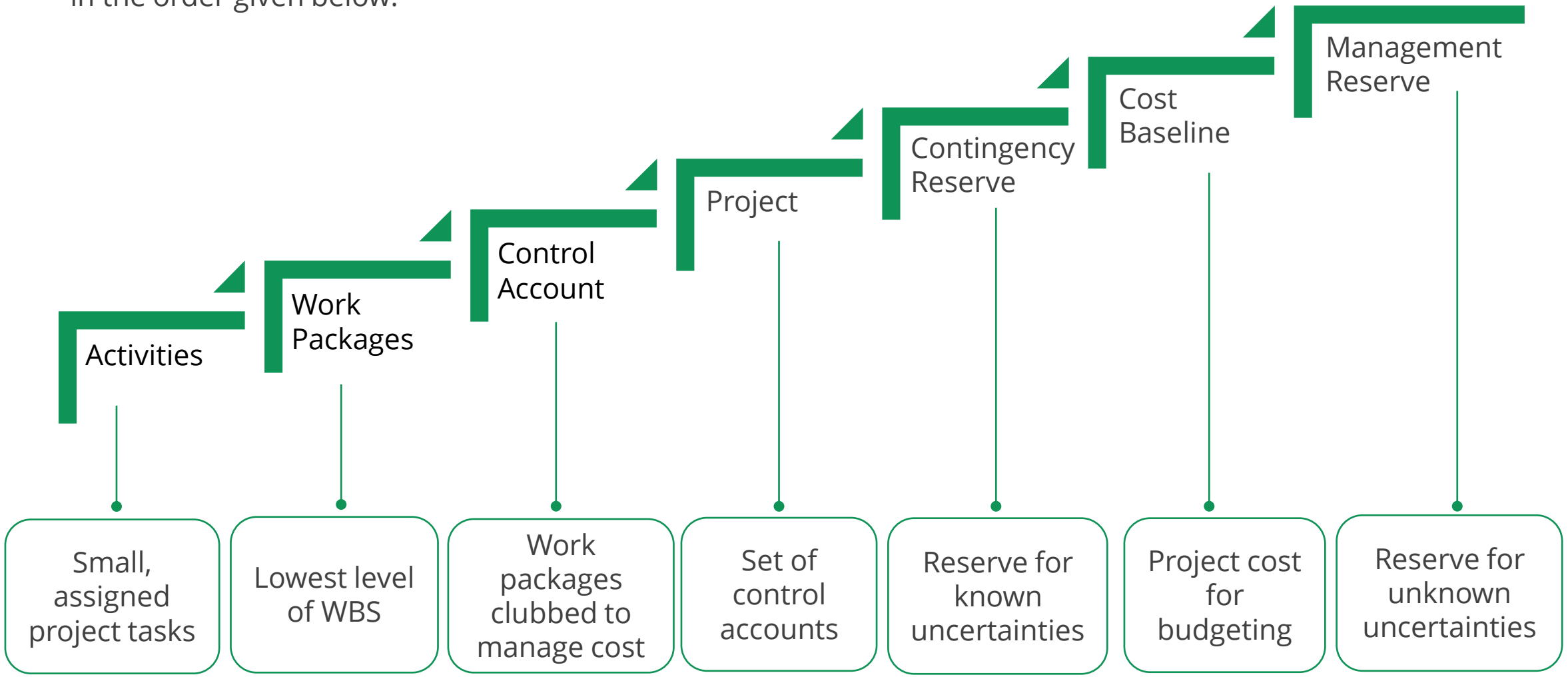
Risk Exposure = Probability * Impact

Risk associated with the new car is $20,000 + ($15,000 * 10%) + ($000*90%) = $21,500

Risk associated with the old car is $15,000 + ($10,000*70%) + ($000*30%) = $22,000

Risk Reserve

Project cost should include both the known and unknown risks. The various risk reserves are calculated in the order given below:



Project Risk Management

The definition of *Project Risk Management is as follows:

Project Risk Management includes the processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project.

The key objective of risk management is to:

- Increase the probability and impact of positive events
- Decrease the probability and impact of negative events

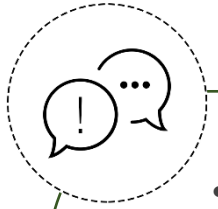
*Definition taken from the Glossary of the Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide)* – Sixth Edition, Project Management Institute, Inc., 2017, Page 395

Business Scenario

PROBLEM STATEMENT

- Cynthia is a subject matter expert and the Director of New Store Construction in Small Markets. As she has expertise and experience in managing complex store construction for the corporation, she has been appointed as the manager of a new, large, and complex construction project involving a gas station.
- None of the previous construction projects included a gas station and convenience store component. Since this is a new initiative and a way for the company to diversify its business, this project is critical to the business, very visible to senior management, and can be a career maker or breaker.
- The senior management team is anxious to see the project brought to life, but the company lacks a strong risk management process. The company would like Cynthia to prepare a risk response plan and submit it prior to the project's first milestone in 3 weeks. What should Cynthia do?

Business Scenario



SOLUTION

- As the company lacks a risk management structure and has handled risk poorly in the past, Cynthia should first search internally for risk experts. Internal experts would be knowledgeable of risks that exist within the business as it deals with construction.
- She should then identify subject matter experts external to the organization who are knowledgeable about risk management as it relates to convenience stores with a gas station component.
- Another viable resource would be the historical documents around risk from previously completed projects, which will also point out other stakeholders and/or SMEs who can contribute to the risk response planning process.
- After the key players are in place, Cynthia can work with them to go through the identification and prioritization process of risk that leads up to the development of their plan.

Project Risk Management Processes

Highlighted here are the Project Risk Management processes:

Knowledge Areas		Project Integration Management	Project Scope Management	Project Schedule Management	Project Cost Management	Project Quality Management	Project Resource Management	Project Communications Management	Project Risk Management	Project Procurement Management	Project Stakeholder Management
Project Management Process Groups	**Initiating**	4.1 Develop Project Charter									13.1 Identify Stakeholders
	Planning	4.2 Develop Project Management Plan	5.1 Plan Scope 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS	6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule	7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget	8.1 Plan Quality Management	9.1 Plan Resource Management 9.2 Estimate Activity Resources	10.1 Plan Communications Management	11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Response	12.1 Plan Procurement Management	13.2 Plan Stakeholder Engagement
	Executing	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge				8.2 Manage Quality	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	10.2 Manage Communications	11.6 Implement Risk Response	12.2 Conduct Procurements	13.3 Manage Stakeholder Engagement
	Monitoring and Controlling	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	5.5 Validate Scope 5.6 Control Scope	6.6 Control Schedulel	7.4 Control Costs	8.3 Control Quality	9.6 Control Resource	10.3 Monitor Communications	11.7 Monitor Risks	12.3 Control Procurements	13.4 Monitor Stakeholder Engagements
	Closing	4.7 Close Poject or Phase									

Table 1-4. Project Management Process Group and Knowledge Area Mapping

Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide)* – Sixth Edition, Project Management Institute, Inc., 2017, Page 25

Plan Risk Management

"Plan Risk Management is the process of defining how to conduct risk management activities for a project. The key benefit of this process is it ensures that the degree, type, and visibility of risk management are proportionate to both risks and the importance of the project to the organization and other stakeholders." It is part of the Planning Process Group.

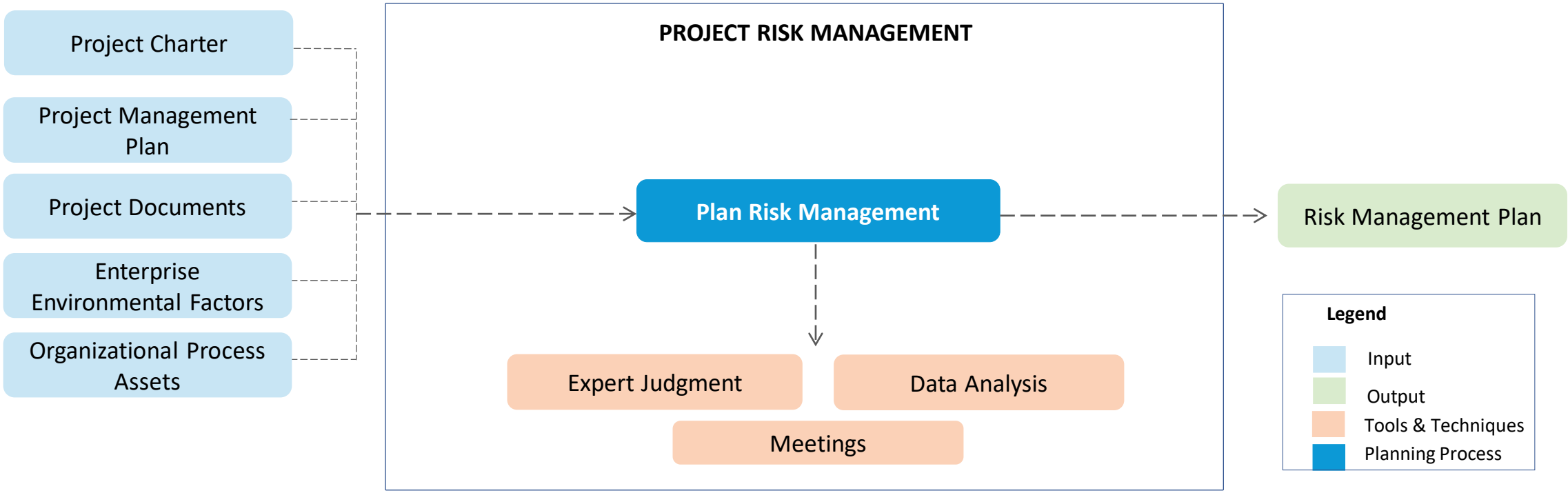


Figure 11-2. Plan Risk Management: Inputs, Tools & Techniques, and Outputs

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Definition of Impact Scale

The table given below shows the impact on scope, cost, time, and quality.

Project Objective	Very Low 0.05	Low 0.1	Moderate 0.2	High 0.4	Very High 0.8
Scope	Barely noticeable change	Minor areas affected	Some important areas affected	Unacceptable change in scope	Entire scope rendered useless
Cost	Insignificant cost increase	<10% cost increase	10-20% cost increase	20-40% cost increase	>40% cost increase
Time	Insignificant change	<5% change to schedule	5-10% change to schedule	10-20% schedule change	>20% schedule change
Quality	Barely noticeable degradation	Few parameters affected	Needs sponsor approval	Major quality compromise	Need to scrap the project

Identify Risks

"Identify Risks is the process of identifying individual project risks as well as sources of overall project risk and documenting their characteristics." It belongs to the Planning Process Group.

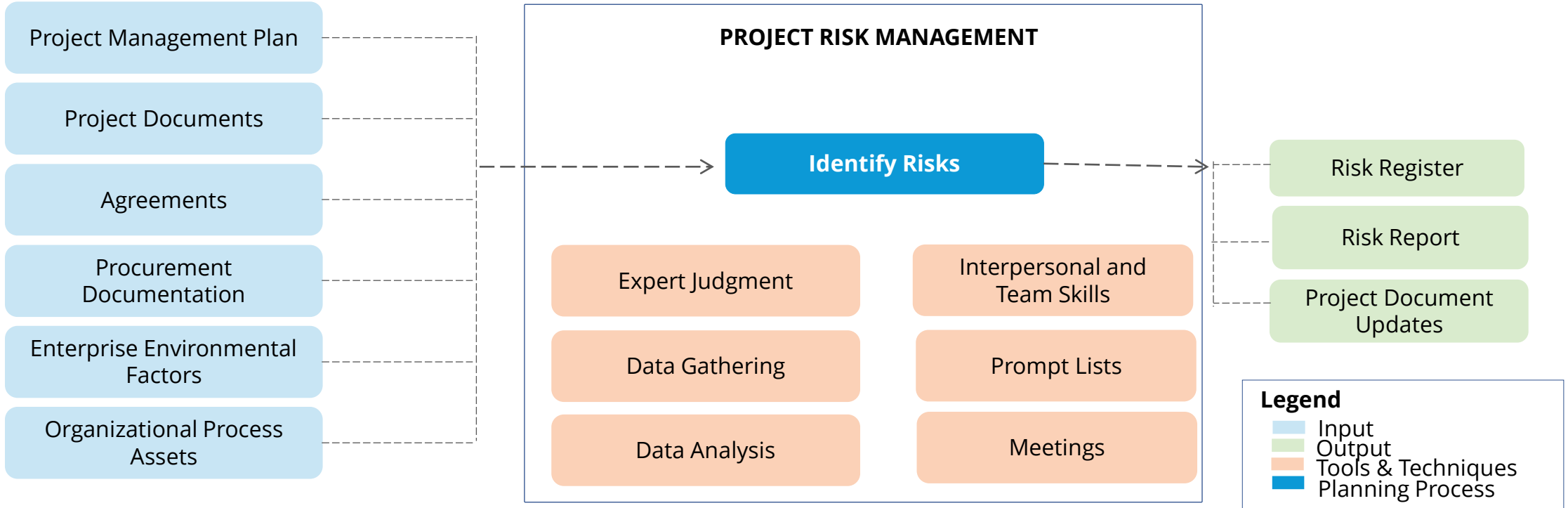

Figure 11-6. Identify Risks: Inputs, Tools & Techniques, and Outputs

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Perform Qualitative Risk Analysis

"Perform Qualitative Risk Analysis is the process of prioritizing individual project risks for further analysis or action by assessing their probability of occurrence and impact as well as other characteristics." This process belongs to the Planning Process Group.

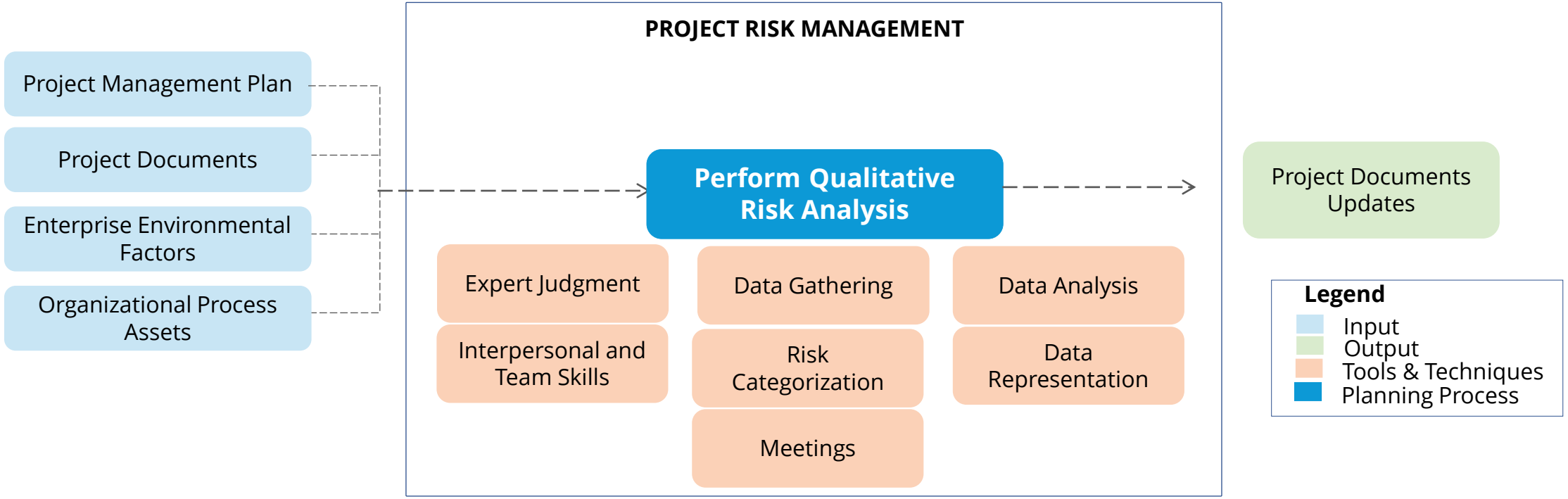

Figure 11-8. Perform Qualitative Risk Analysis: Inputs, Tools & Techniques, and Outputs

Concept based questions on qualitative risk analysis can be expected in the exam.

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Probability and Impact Matrix: Example

A probability and impact matrix tabulates the probability and impact scales for the opportunities and threats on the project.

	Probability	Threats					Opportunities				
High	0.9	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05
	0.7	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04
Medium	0.5	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03
Low	0.3	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02
	0.1	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01
	Impact	0.05	0.10	0.20	0.40	0.80	0.80	0.40	0.20	0.10	0.05
		Low		Medium		High					

! Once the probability and impact matrix is filled, a risk threshold can be defined, and a risk becomes a candidate for active management.

Perform Quantitative Risk Analysis

"Perform Quantitative Risk Analysis is the process of numerically analyzing the combined effect of identified individual project risks and other sources of uncertainty on overall project objectives." This is a part of the Planning Process Group.

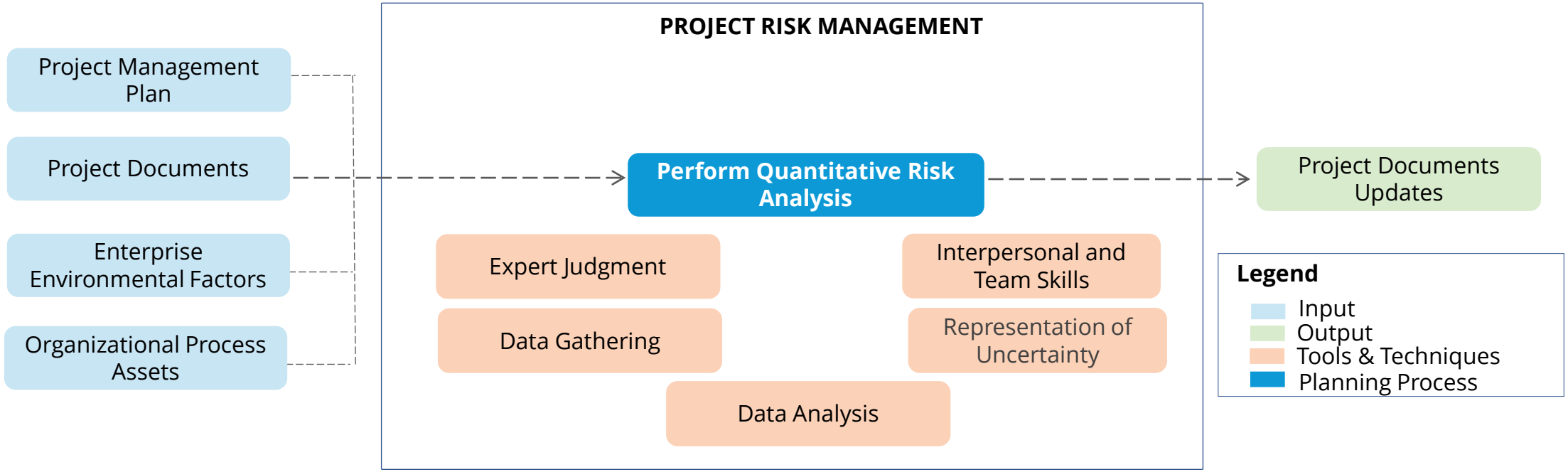

Figure 11-11. Perform Quantitative Risk Analysis: Inputs, Tools & Techniques, and Outputs

Concept-based questions on quantitative risk analysis can be expected in the exam.

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Plan Risk Responses

"Plan Risk Responses is 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."

It is part of the Planning Process Group.

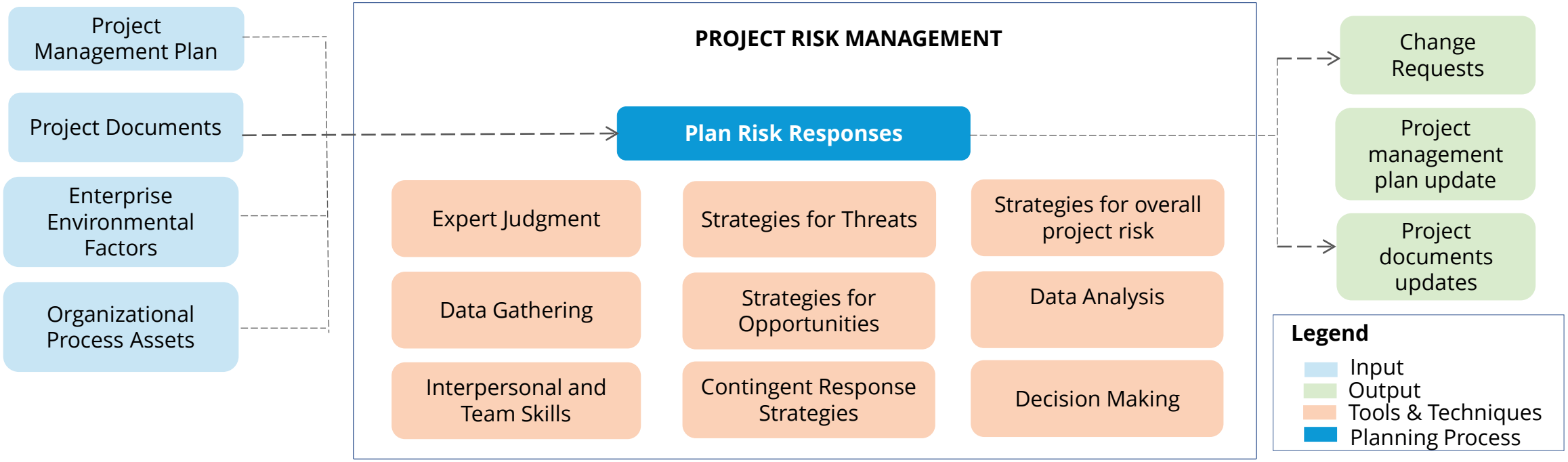

Figure 11-16. Plan Risk Responses: Inputs, Tools & Techniques, and Outputs

! Residual risks are those that remain after the risk responses were implemented.

Secondary risks arise out of implementing risk responses.

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Positive Risk Responses

Positive risks have positive effects associated with them and are often called opportunities. There are five response types for positive risks.

Escalation

Escalation is used when the opportunity is outside the scope of the project or when the risk is beyond project manager's authority.
Example: Buying a software licence can be useful for other projects and the entire organization.

Exploit

The exploit strategy can be used for high-priority opportunities, where the organization wants to ensure that the opportunity is realized.
Example: A large software development project has three teams working on different components within the architecture. If one of the teams completes work sooner than scheduled, the project manager can exploit this opportunity by allocating work from the other two teams to it.

Share

Sharing involves transferring ownership of an opportunity to a third party so that it shares some of the benefit if the opportunity occurs.
Example: Your company is bidding for a large engineering project for a hydroelectric dam. As the team reviews the scope of the project, it sees an opportunity to increase its success if it partners with a company that has experience with advanced hydroelectric technology. The positive benefits of this risk are shared with the other company.

Positive Risk Responses (Contd.)

Enhance

The enhance strategy is used to increase the probability or impact of an opportunity.
Example: A construction project that involves building six apartment complexes in different parts of the country is underway. One of the teams is using a new construction design tool that has increased efficiency by 20%. The project manager enhances this result by having the other construction teams use the same tool.

Accept

Accepting an opportunity acknowledges its existence, but no proactive action is taken.
Example: A project constructing an overpass in a large city will have a pool of experienced construction workers to draw upon. As the project scope is constrained to the construction of this overpass and there is little opportunity to enhance, share, or exploit the positive effects of this risk, the project manager accepts the risk.

Negative Risk Responses

Negative risks have negative effects associated with them and are often called threats. There are five response types for negative risks.

Escalation

Escalation is used when the threat is outside the scope of the project or when the risk is beyond project manager's authority.
Example: There may be an increase in the cost, which is beyond the baseline. This requires the attention of the sponsor or program manager.

Avoid

Risk avoidance is when the project teams act to eliminate the threat or protect the project from its impact.
Example: A project is building a new offshore drilling rig in the Gulf of Mexico. The risk of a hurricane during setup would impact schedule and budget. The project manager avoids this risk by setting up the rig after the hurricane season.

Transfer

Transfer involves shifting ownership of a threat to a third party to manage the risk and to bear the impact if the risk occurs.
Example: A large commercial office building is under construction. The work location has many flammable materials and there is a risk of fire that could damage/destroy the structure and cause significant budget/schedule impact. The project manager includes fire insurance in the budget during the construction phase until fire prevention equipment is installed.

Negative Risk Responses (Contd.)

Mitigate

In risk mitigation, action is taken to reduce the probability of occurrence or impact.
Example: A software development project is transitioning from the Java to .NET programming language. The risk that the developers will not be as familiar with .NET could lead to project schedule delays. The project manager mitigates this risk by providing training to the developers and hiring a .NET developer as a contractor.

Accept

Risk acceptance acknowledges the existence of a threat, but no proactive action is taken.
Example: A project manager is concerned that his team does not have access to a printer at their work location. This will require the team to walk down the hall whenever they need a printout. The project manager decides to accept this risk as it has a low impact on his project.

Implement Risk Response

"Implement Risk Response is the process of implementing agreed-upon risk response plans. The key benefit of this process is it ensures that agreed-upon risk responses are executed as planned in order to address overall project risk exposure, minimize individual project threats, and maximize overall project opportunities." It is part of the Executing Process Group.

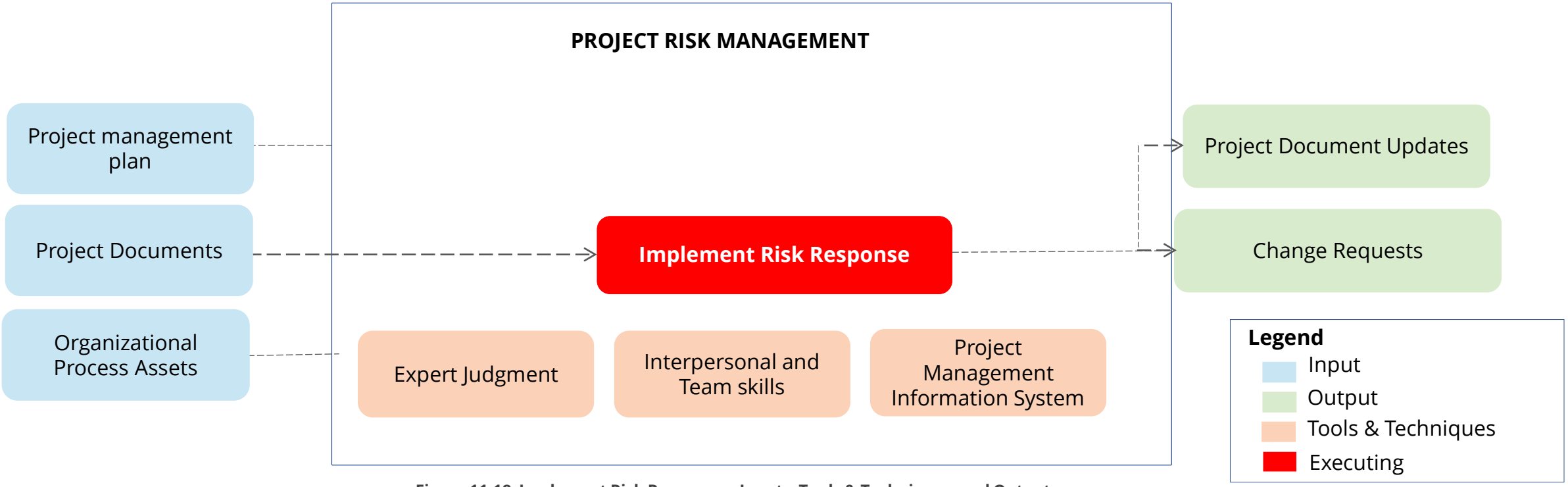

Figure 11-18. Implement Risk Responses: Inputs, Tools & Techniques, and Outputs

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Monitor Risks

"Monitor Risks is the process of monitoring the implementation of agreed-upon risk response plans, tracking identified risks, identifying and analyzing new risks, and evaluating risk response effectiveness throughout the project." It is part of the Monitoring and Controlling Process Group.

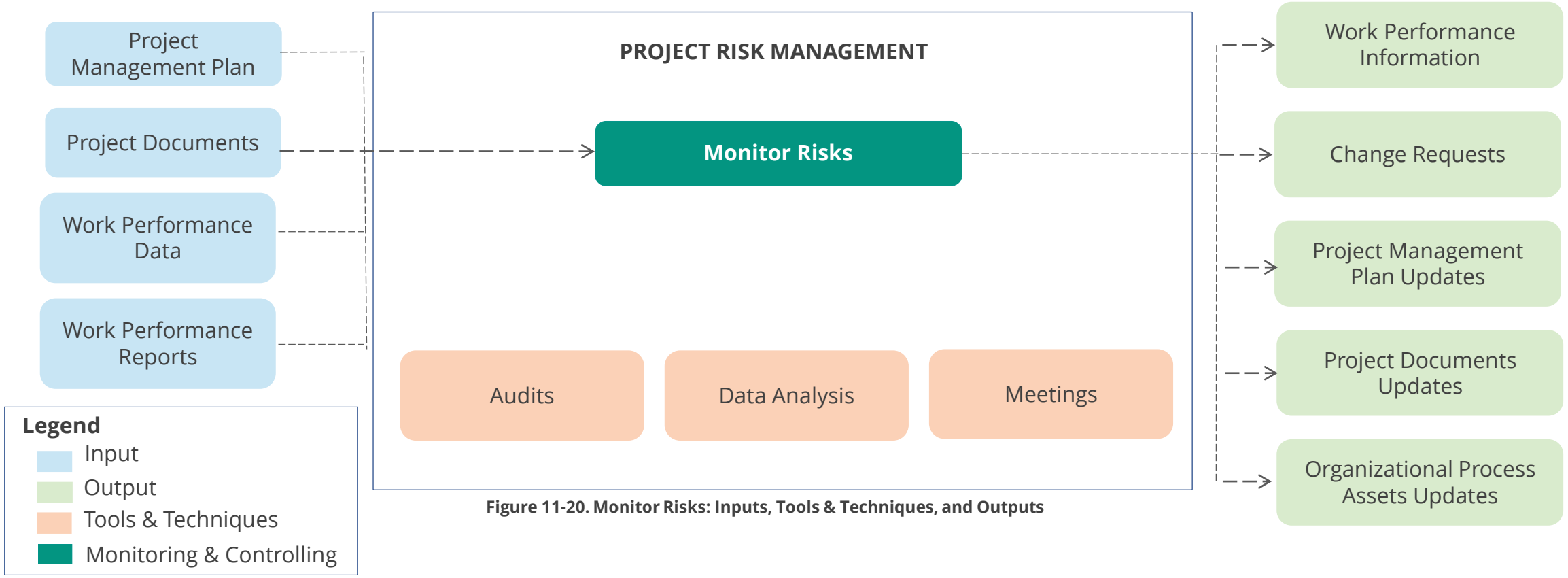

Figure 11-20. Monitor Risks: Inputs, Tools & Techniques, and Outputs

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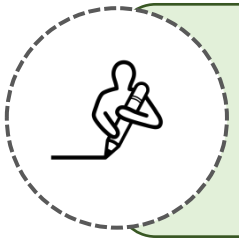
PROJECT MANAGEMENT

Key Takeaways

- Risk is an uncertain event or condition that has a positive or negative effect on a project's objectives.
- Risk is calculated by multiplying probability and impact of risk (Risk Weighting = Probability * Impact).
- Risk can be classified in various ways. Under one category, risks are classified as external, internal, technical, and project management. On the basis of origin, risks can be classified as scope, resource, schedule, cost, and quality risks.
- A decision tree is used to analyze risk and its impact on decisions in the face of uncertainties.
- The seven Project Risk Management processes are Plan Risk Management, Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, Plan Risk Responses, Implement Risk Responses, and Monitor Risks.

Additional Reading

(Refer to the exercises provided in the PMP Classroom Exercises)



- Exercise 19
- Exercise 20

PROJECT MANAGEMENT

Quiz

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Quiz

1. **Purchasing insurance coverage for your project equipment is an example of _____ risk response.**

A. Transfer

B. Mitigation

C. Acceptance

D. Avoidance

Quiz

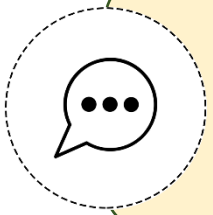
1. **Purchasing insurance coverage for your project equipment is an example of _____ risk response.**

A. Transfer

B. Mitigation

C. Acceptance

D. Avoidance



The correct answer is: **A**

This is an example of transfer as the financial risk is transferred to the insurance company.

Quiz

2. What action should a project manager first take when an unidentified risk event occurs?

A. Inform the customer of the possible consequences

B. Inform the senior management of the possible consequences

C. Redo the risk identification process to prepare for other ‘known-unknowns’

D. Create a work-around

Quiz

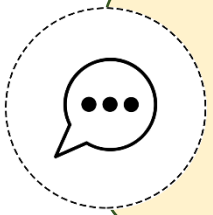
2. What action should a project manager first take when an unidentified risk event occurs?

A. Inform the customer of the possible consequences

B. Inform the senior management of the possible consequences

C. Redo the risk identification process to prepare for other 'known-unknowns'

D. Create a work-around



The correct answer is: **D**

The right project management practice is to create a work-around as a response to the event.

Quiz

3. **You are a project manager at a financial firm that has multinational dealings. You feel the financial meltdown in one of the client countries could affect your project adversely, so you want to hedge your risks. Although the probability of occurrence of the event is low, you are advised to play it safe. In terms of risk attitude, your organization could best be described as?**

A. Risk Seeker

B. Risk Averse

C. Risk Neutral

D. Risk Mitigator

Quiz

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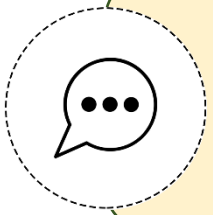

The correct answer is: **B**

Someone who doesn't want to take risks is called risk averse, and the attitude of the organization seems to be the same.

Quiz

4. Decision tree analysis can be described as a _____.

A. Diagramming and calculation technique to select the best option in the presence of uncertainty

B. Subset of the EMV technique

C. Subset of the Earned Value Management (EVM) technique

D. Risk response strategy

Quiz

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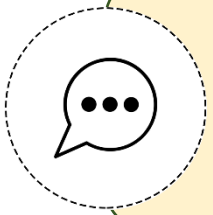

The correct answer is: **A**

Decision tree analysis is a quantitative risk analysis technique that involves a diagram describing different decisions under consideration and the impact on the project of choosing one over the other.

Quiz

5. How early can comprehensive risk analysis be done on a project?

A. During project initiation

B. After scope decomposition

C. During scope validation

D. After the project management plan has been baselined

Quiz

5. How early can comprehensive risk analysis be done on a project?

A During project initiation

B After scope decomposition

C During scope validation

D After the project management plan has been baselined

The correct answer is: **B**

A comprehensive risk analysis can be done only after the entire scope has been defined in the Work Breakdown Structure (WBS).

Quiz

6. A project manager is managing a pilot project of a short duration and has started the risk management planning process. He has identified new risks and prioritized them based on the probability and impact matrix. The project manager now proceeds to plan responses for the risks without analyzing the risks numerically. According to you, this decision of project manager is:

A. Incorrect, as it is important to numerically analyze each risk so that it can be responded properly

B. Correct, as quantitative risk analysis is a waste of time and not required if risks are already assessed qualitatively

C. Incorrect, as quantitative risk analysis is important to calculate EMV for each risk and then later move to risk response planning

D. Correct, as this is a short project and project manager might skip quantitative risk analysis if he feels it is not assisting in the risk management process

Quiz

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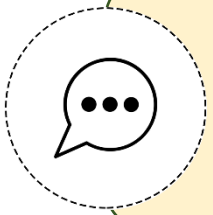

The correct answer is: **D**

The amount of rigor in the analysis is dependent upon the duration and complexity of the project. For a project with a short duration, it may not be necessary to perform numeric (quantitative) risk analysis.

Quiz

7. Which of the following is not a response type for positive risks?

A. Exploit

B. Enhance

C. Accept

D. Leverage

Quiz

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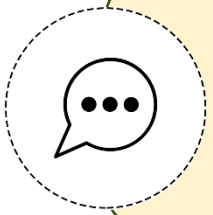
B Enhance

C Accept

D Leverage



The correct answer is: **D**

Leverage is not one of the positive risk responses identified by PMBOK. Escalate, Exploit, Enhance, Accept, and Share are the four positive risk responses.

Quiz

8. John is managing a project. He conducted a risk assessment workshop with project stakeholders and identified several risks. He is concerned about the amount of time it will take for quantitative and qualitative risk analysis and to develop a risk response plan. What should John do?

A. As the risks were identified by project stakeholders, John needs to ensure that each risk follows the risk management processes.

B. John should use his expert judgement to decide which risks warrant more complete risk analysis and response.

C. John should create a Probability and Impact matrix that determines risk thresholds for quantitative and qualitative risk assessments. He should apply this to his Risk Register and use that to determine which risks need analysis and risk responses.

D. John should refer this decision to the project stakeholders who can determine which risks merit response.

Quiz

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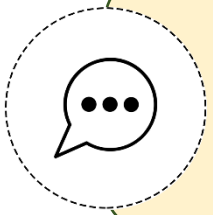

The correct answer is: **C**

The Probability and Impact matrix is an important tool for project managers to determine which risks warrant deeper analysis and response plans. The PMO at John's company might already have a matrix that he can leverage.

This concludes "Project Risk Management."

The next lesson is "Project Procurement Management."