Manajemen Proyek Sistem Informasi

PROJECT RISK MANAGEMENT

S1 SISTEM INFORMASI

FAKULTAS REKAYASA INDUSTRI

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Learning Objectives

- Understand what risk is and the importance of good project risk management
- Discuss the elements involved in risk management planning and the contents of a risk management plan
- List common sources of risks in information technology projects

Learning Objectives (Cont)

- Describe the risk identification process, tools and techniques to help identify project risks, and the main output of risk identification: a **risk register**

- Discuss the **qualitative risk analysis process** and explain how to calculate risk factors, create probability/impact matrixes, and apply the Top Ten Risk Item Tracking technique to rank risks

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Learning Objectives (Cont)

- Explain the **quantitative risk analysis process** and how to apply decision trees, simulation, and sensitivity analysis to quantify risks
- Provide examples of using different **risk response planning strategies** to address both **negative and positive risks**
- Discuss what is involved in **risk monitoring and control**
- Describe how software can assist in project risk management

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The Importance of Project Risk Management

- Project risk management is the art and science of **identifying, analyzing, and responding to risk throughout the life of a project and in the best interests of meeting project objectives**
- Risk management is often overlooked in projects, but i**t can help improve project success by helping select good projects, determining project scope, and developing realistic estimates**
- Unfortunately, crisis management has higher visibility due to the obvious danger to the success of the project but it's **risk management that helps a project have fewer problems to begin with**.

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Project Management Maturity by Industry Group and Knowledge Area*

KEY: 1 = LOWEST MATURITY RATING **5 = HIGHEST MATURITY RATING**

Knowledge Area	Engineering/ Construction	Telecommunications	Information Systems	Hi-Tech Manufacturing
Scope	3.52	3.45	3.25	3.37
Time	3.55	3.41	3.03	3.50
Cost	3.74	3.22	3.20	3.97
Quality	2.91	3.22	2.88	3.26
Human Resources	3.18	3.20	2.93	3.18
Communications	3.53	3.53	3.21	3.48
Risk	**2.93**	**2.87**	**2.75**	**2.76**
Procurement	3.33	3.01	2.91	3.33

*Ibbs, C. William and Young Hoon Kwak. "Assessing Project Management Maturity," *Project Management Journal* (March 2000).

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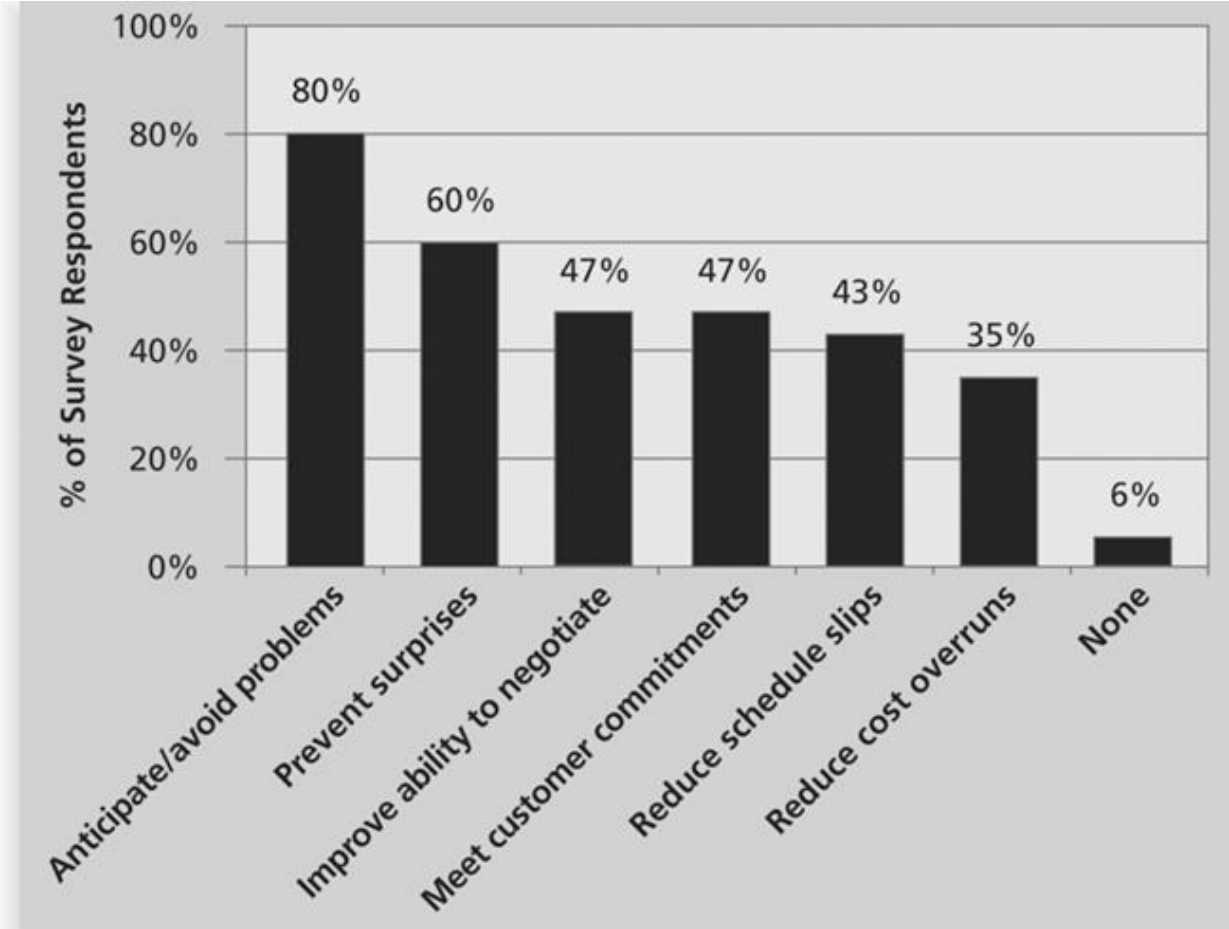
Benefits from Software Risk Management Practices*



*Kulik, Peter and Catherine Weber, “Software Risk Management Practices – 2001,” KLCI Research Group (August 2001).

Negative Risk

- A dictionary definition of risk is “the possibility of loss or injury”
- **Negative risk** involves **understanding potential problems that might occur in the project and how they might impede project success**
- Negative risk management is like a form of insurance; it is an investment
- If IT projects are so risky, why do companies pursue them?

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Risk Can Be Positive

- **Positive risks** are **risks that result in good things happening; sometimes called opportunities**
- A general definition of project **risk** is **an uncertainty that can have a negative or positive effect on meeting project objectives**
- The goal of project risk management is to **minimize potential negative risks** while **maximizing potential positive risks**

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Risk Utility

- Different organizations and people have different tolerances for risk
- **Risk utility** or **risk tolerance** is the **amount of satisfaction or pleasure received from a potential payoff**
  - Utility rises at a decreasing rate for people who are risk-averse
  - Those who are risk-seeking have a higher tolerance for risk and their satisfaction increases when more payoff is at stake
  - The risk-neutral approach achieves a balance between risk and payoff

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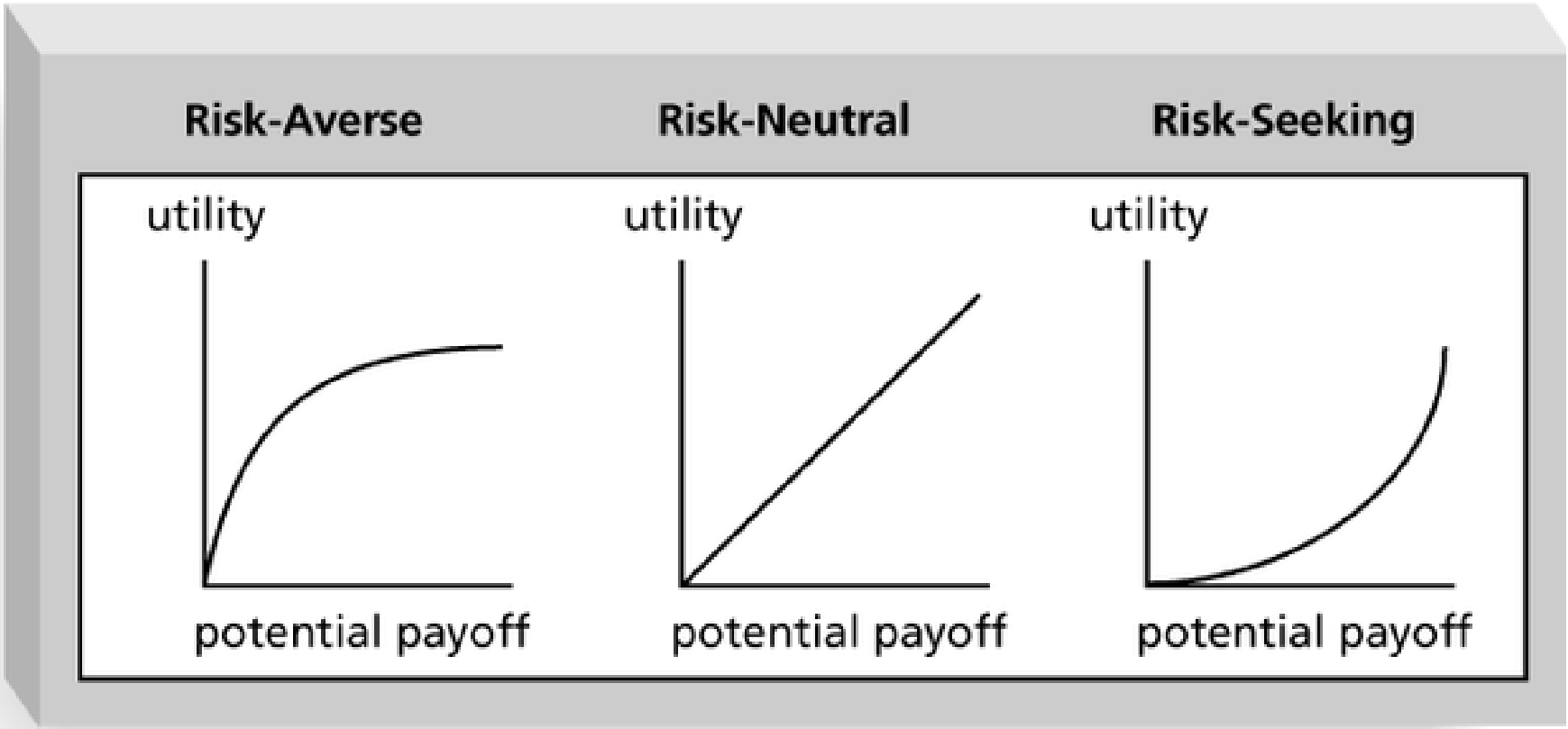
Risk Utility Function and Risk Preference



Project Risk Management Processes

- **Risk management planning**: deciding how to approach and plan the risk management activities for the project
- **Risk identification**: determining which risks are likely to affect a project and documenting the characteristics of each
- **Qualitative risk analysis**: prioritizing risks based on their probability and impact of occurrence

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Project Risk Management Processes (Cont)

- **Quantitative risk analysis**: numerically estimating the effects of risks on project objectives
- **Risk response planning**: taking steps to enhance opportunities and reduce threats to meeting project objectives
- **Risk monitoring and control**: monitoring identified and residual risks, identifying new risks, carrying out risk response plans, and evaluating the effectiveness of risk strategies throughout the life of the project

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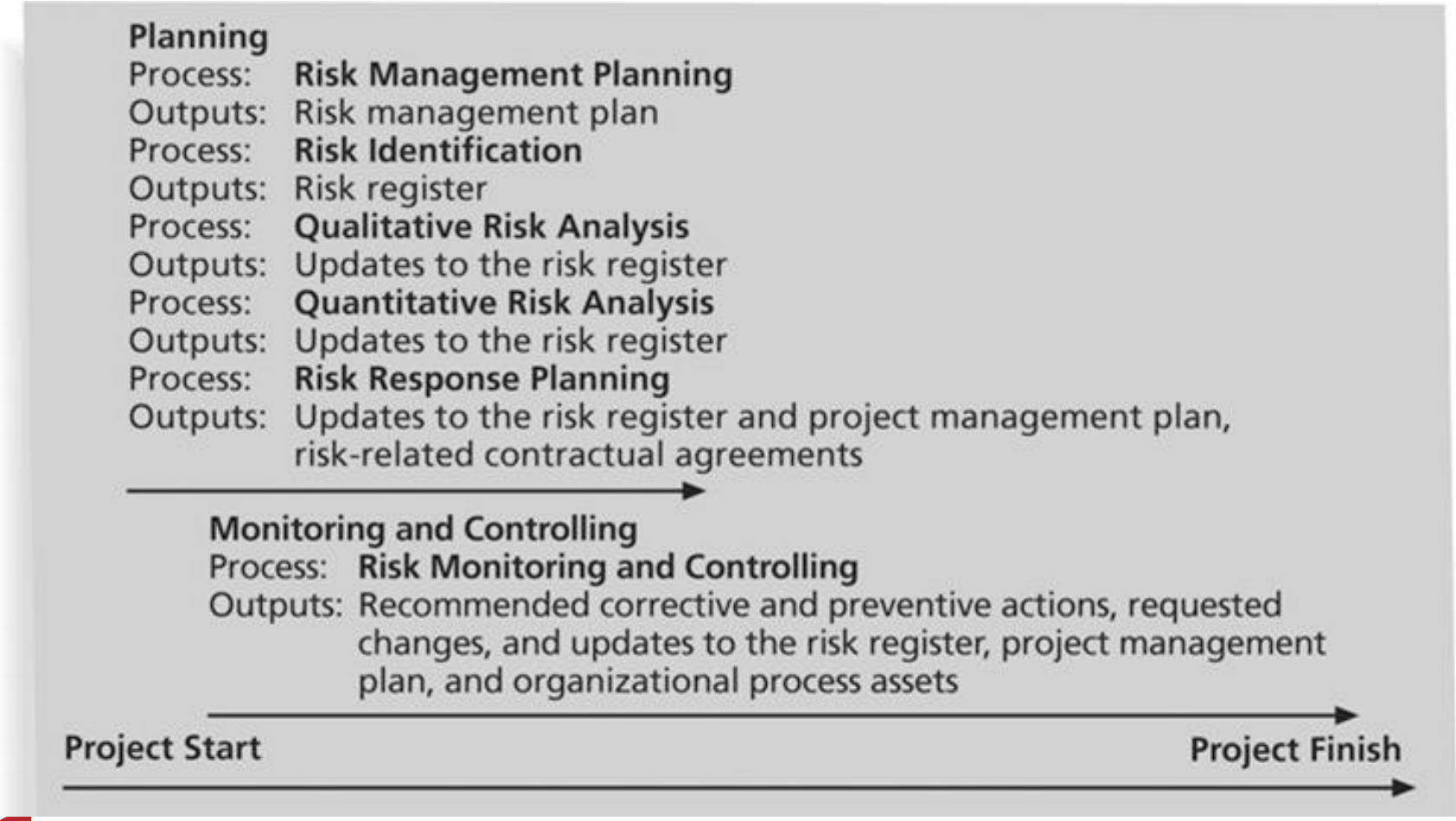
Project Risk Management Summary



Risk Management Planning

- The **main output** of risk management planning is a **risk management plan**—a plan that documents the procedures for managing risk throughout a project
- The project team should review project documents, corporate risk management policies, lessons-learned reports from past projects and understand the organization's and the sponsor's approaches to risk
  - Important to clarify roles and responsibilities, prepare budget and schedule estimates for risk-related work and identify risk categories for consideration
- The level of detail will vary with the needs of the project

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Topics Addressed in a Risk Management Plan

- **Methodology:** How will risk management be performed on this project? What tools and data sources are available and applicable?
- **Roles and Responsibilities:** Who are the individuals responsible for implementing specific tasks and providing deliverables related to risk management?
- **Budget and Schedule:** What are the estimated costs and schedules for performing risk-related activities?
- **Risk Categories:** What are the main categories of risks that should be addressed on this project? Is there a risk breakdown structure for the project?
- **Risk Probability and Impact:** How will the probabilities and impacts of risk items be assessed? What scoring and interpretation methods will be used for the qualitative and quantitative analysis of risks?
- **Risk Documentation:** What reporting formats and processes will be used for risk management activities?

Contingency and Fallback Plans, Contingency Reserves

- In addition to a risk management plan, many projects also include:
  - **Contingency plans – predefined actions that the project team will take if an identified risk event occurs**
    - Expecting new release of a s/w package, must plan to use older version if delayed
  - **Fallback plans - developed for risks that have a high impact on meeting project objectives, and are put into effect if attempts to reduce the risk are not effective**
    - College grad has main plan and contingency plans of where to live after graduation but needs fallback plan to possibly live at home
  - **Contingency reserves** or **allowances - provisions held by the project sponsor or organization to reduce the risk of cost or schedule overruns to an acceptable level**
    - Project falling behind schedule due to inexperience with new technology, use these funds to hire outside trainer

Information Technology Success Potential Scoring Sheet

Success Criterion	Relative Importance
User Involvement	19
Executive Management support	16
Clear Statement of Requirements	15
Proper Planning	11
Realistic Expectations	10
Smaller Project Milestones	9
Competent Staff	8
Ownership	6
Clear Visions and Objectives	3
Hard-Working, Focused Staff	3
Total	**100**

- The number of questions corresponding to each success criterion determines the number of points each positive response is assigned
  - Ex: User involvement: 19/5 (or 3.8) points per question answered positively

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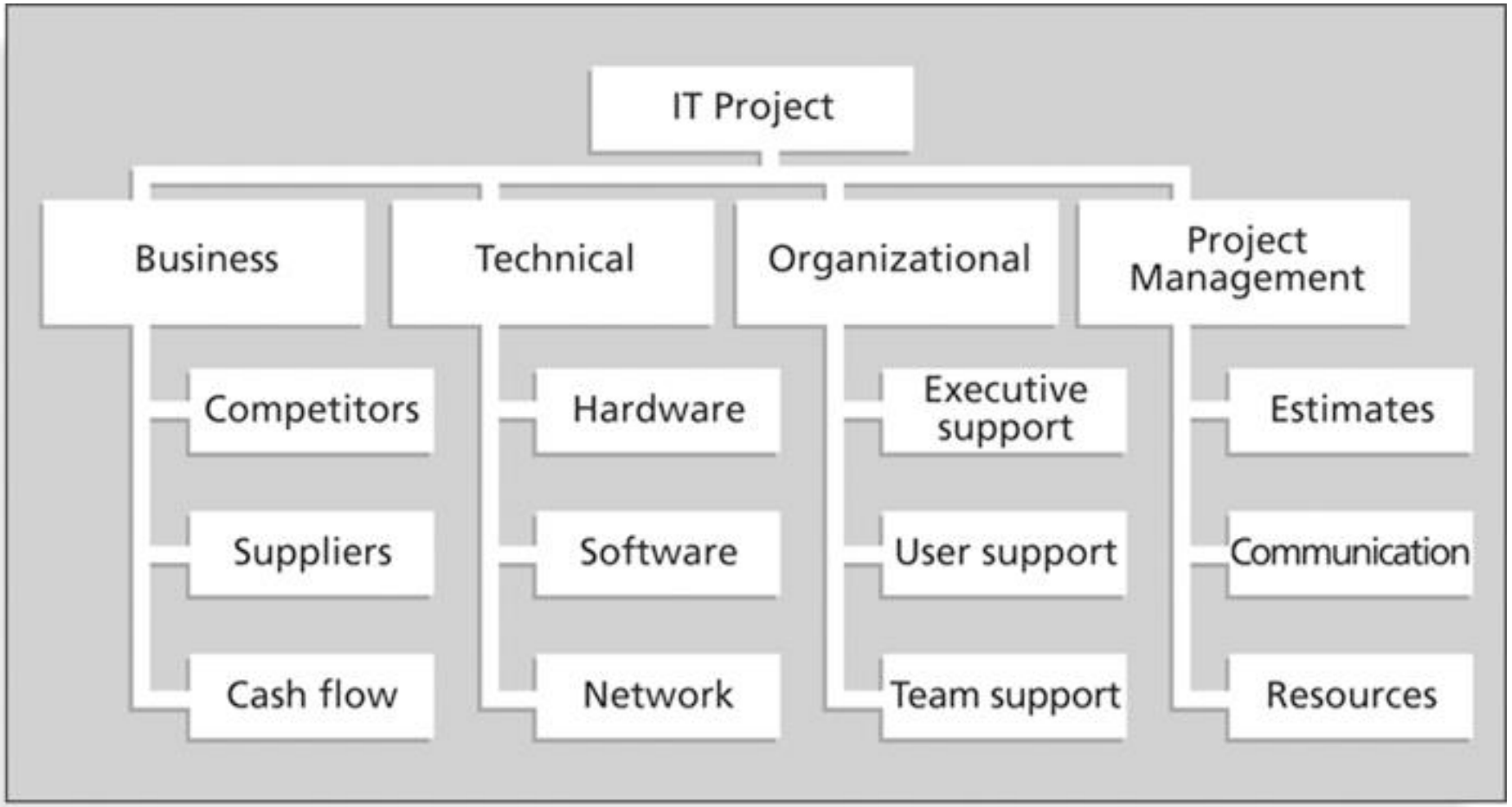
Broad Categories of Risk

- Many organizations develop their own risk questionnaires. Some of the categories of risk might include:
  - **Market risk** – Will the new service or product be useful to the organization or marketable to others? Will the users accept it? Will someone else create a better product?
  - **Financial risk** – can the organization afford to undertake the project? Will the project meet NPV, ROI and payback estimates?
  - **Technology risk** – is the project technically feasible? Is it leading edge or bleeding edge technology?
  - **People risk** – Are people with appropriate skills available to help complete the project? Does senior management support the project?
  - **Structure/process risk** – What is the degree of change the new project will introduce into user areas and business procedures? With how many other systems does a new project/system need to interact?

Risk Breakdown Structure

- A **risk breakdown structure** is a hierarchy of potential risk categories for a project
- Similar to a work breakdown structure but used to identify and categorize risks
- In addition to identifying risk based on the nature of the project or products produced, it is also important to identify potential risks according to project management knowledge areas

Sample Risk Breakdown Structure



Potential Negative Risk Conditions Associated With Each Knowledge Area

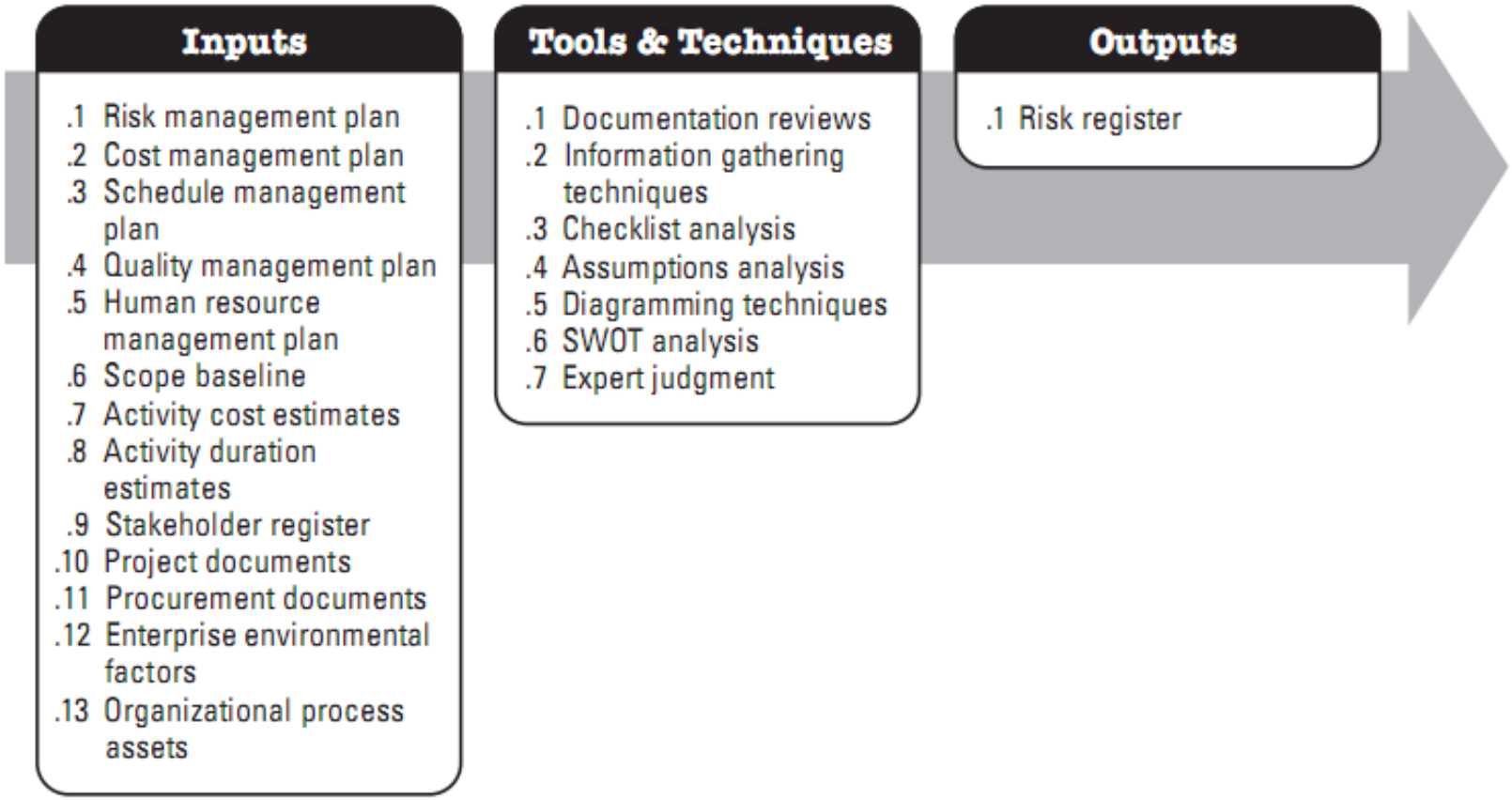
Knowledge Area	Risk Conditions
Integration	Inadequate planning; poor resource allocation; poor integration management; lack of post-project review
Scope	Poor definition of scope or work packages; incomplete definition
Time	Errors in estimating time or resource availability; errors in determining the critical path; poor allocation and management of float; early release of competitive products
Cost	Estimating errors; inadequate productivity, cost, change, or contingency
Quality	Poor attitude toward quality; substandard design/materials/workmanship; inadequate quality assurance program
Human Resources	Poor conflict management; poor project organization and definition of responsibilities; absence of leadership
Communications	Carelessness in planning or communicating; lack of consultation with key stakeholders
Risk	Ignoring risk; unclear analysis of risk; poor insurance management
Procurement	Unenforceable conditions or contract clauses; adversarial relations

Plan Risk Management ITTO

Risk Identification

- **Risk identification** is the process of understanding what potential events might hurt or enhance a particular project
  - This is an ongoing process throughout the project lifecycle as things change
  - You can not manage risks that you don't identify
- Risk identification **tools and techniques** include:
  - **Brainstorming** (Information Gathering Techniques)
  - **The Delphi Technique** (Information Gathering Techniques)
  - **Interviewing** (Information Gathering Techniques)
  - **SWOT analysis**

Identify Risks ITTO



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Tools & Technique Brainstorming

- **Brainstorming** is a technique by which a group attempts to generate ideas or find a solution for a specific problem by amassing ideas spontaneously and without judgment
- An experienced facilitator should run the brainstorming session
- **Be careful not to overuse or misuse brainstorming**
  - Psychology literature shows that individuals produce a greater number of ideas working alone than they do through brainstorming in small, face-to-face groups
  - Group effects often inhibit idea generation

Tools & Technique Delphi Technique

- The **Delphi Technique** is **used to derive a consensus among a panel of experts who make predictions about future developments**
  - Developed by the RAND Corporation for the US Air Force in the late 1960s
- Provides independent and **anonymous input** regarding future events
- Uses repeated rounds of questioning and written responses and avoids the biasing effects possible in oral methods, such as brainstorming
  - Requires a panel of experts for the particular area in question

Tools & Technique Interviewing

- **Interviewing** is a fact-finding technique for collecting information in face-to-face, phone, e-mail, or instant-messaging discussions
  - Useful to have a prepared set of questions as a guide to the interview
- Interviewing people with similar project experience is an important tool for identifying potential risks

Tools & Technique SWOT Analysis

- **SWOT analysis** (strengths, weaknesses, opportunities, and threats) can also be used during risk identification
- Project teams focus on the broad perspectives of potential risks for particular projects
  - What are the company's strengths and weaknesses related to this project
  - What opportunities and threats exist
- Helps identify the broad negative and positive risks that apply to a project

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Other Risk Identification Tools & Technique

- **Checklists** based on risks encountered in previous projects
- Analyze the validity of **project assumptions** as incomplete, inaccurate and/or inconsistent assumptions can lead to identifying more risks
- **Diagramming techniques**: cause-and-effect, fishbone, flowcharts and influence diagrams
  - Influence diagrams represent decision problems by displaying essential elements, including decisions, uncertainties, causality and objectives and how they influence each other

Risk Register

- The **main output of the risk identification process** is a list of identified risks and other information needed to begin creating a risk register
- A **risk register** is:
  - A document that contains the results of various risk management processes and that is often displayed in a table or spreadsheet format
  - A tool for documenting potential risk events and related information
- **Risk events** refer to specific, uncertain events that may occur to the detriment or enhancement of the project
  - Negative risks: delays in completing work as scheduled, increases in estimated costs, supply shortages, litigation, strikes, etc.
  - Positive risks: completing work sooner and/or cheaper than planned, collaborating with suppliers to produce better products, good publicity, etc.

Risk Register Contents

- An identification number for each risk event
- A rank for each risk event
- The name of each risk event
- A description of each risk event
- The category under which each risk event falls
- The root cause of each risk

Risk Register Contents (continued)

- Triggers for each risk; **triggers** are indicators or symptoms of actual risk events
  - Cost overruns on early activities, defective products
- Potential responses to each risk
- The **risk owner** or person who will own or take responsibility for each risk
- The probability and impact of each risk occurring
- The status of each risk

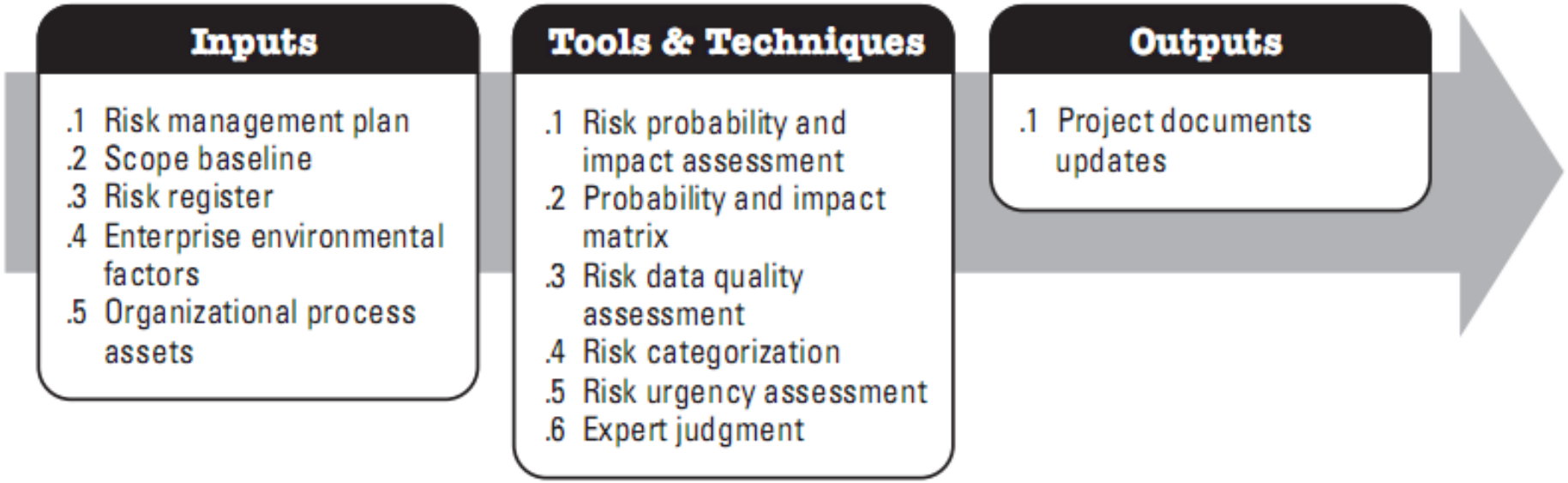
Sample Risk Register

No.	Rank	Risk	Description	Category	Root Cause	Triggers	Potential Responses	Risk Owner	Probability	Impact	Status
R44	1										
R21	2										
R7	3										

Qualitative Risk Analysis

- After identifying risks, the next step is to understand which risks are most important
- **Assess the likelihood and impact of identified risks to determine their magnitude and priority**
- Risk quantification **tools and techniques** include:
  - Probability/impact matrixes
  - Expert judgment

Perform Qualitative Risk Analysis ITTO



Probability/Impact Matrix

- A **probability/impact matrix** or **chart** lists the relative probability of a risk occurring on one side of a matrix or axis on a chart and the relative impact of the risk occurring on the other
- List the risks and then label each one as **high, medium, or low** in terms of its probability of occurrence and its impact if it did occur
- Deal first with those risks in **the high probability/high impact cell**

Sample Probability/Impact Matrix

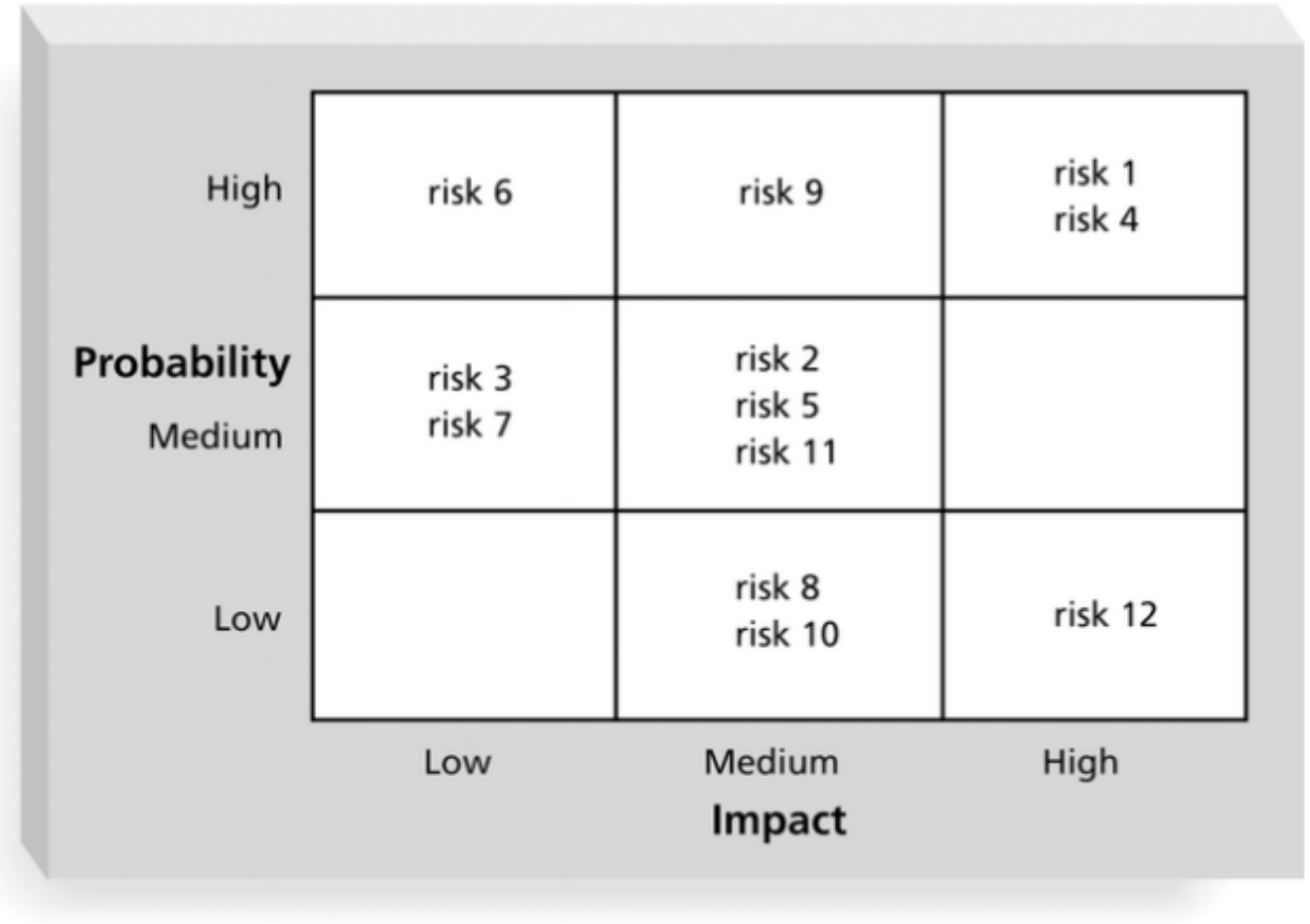


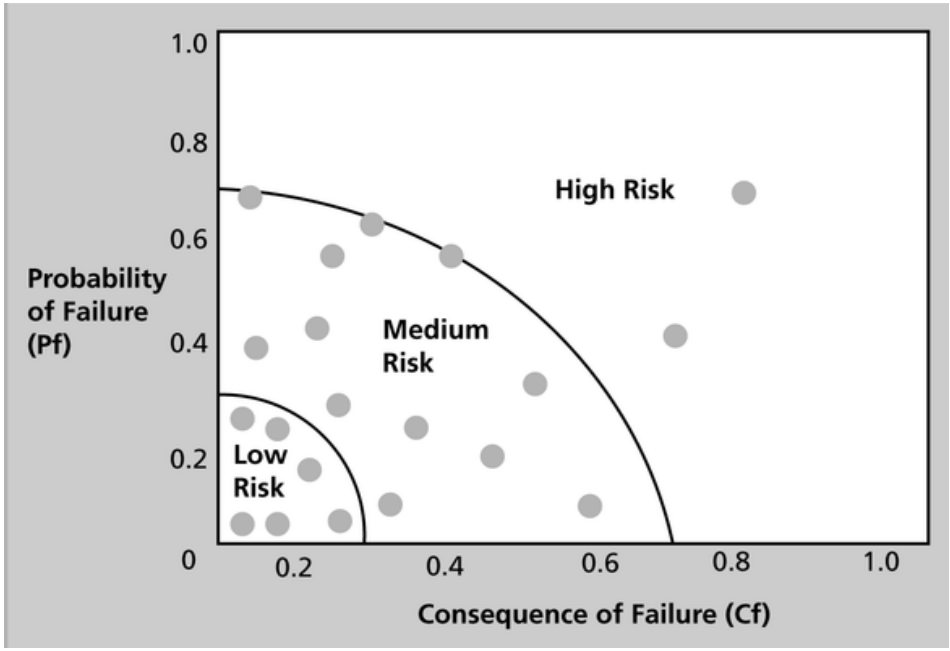
Figure 11-2. Sample Probability/Impact Matrix

Risk factors

- Can also calculate **risk factors**
  - Numbers that represent the overall risk of specific events based on their probability of occurring and the consequences to the project if they do occur
  - **Probabilities of a risk occurring can be estimated based on several factors based on the unique nature of each project**
    - For example: technology not being mature, technology too complex, inadequate support base for developing the technology
  - **The impact of a risk could include factors such as the availability of fallback solutions or the consequences of not meeting performance, cost and schedule estimates**

High-, Medium-, and Low-Risk Technologies

- Example of how risk factors were used to graph the probability of failure and consequence of failure for proposed technologies in a research study to help design more reliable aircraft
- Based on this chart, the recommendation was made to invest in low- to medium-risk technologies and not pursue high-risk technology



Quantitative Risk Analysis

- **numerically estimating the effects of risks on project objectives**
- **Often follows qualitative risk analysis, but both can be done together**
- Large, complex projects involving leading edge technologies **often require extensive quantitative risk analysis**
- **Main techniques include**:
  - Decision tree analysis
  - Simulation
  - Sensitivity analysis

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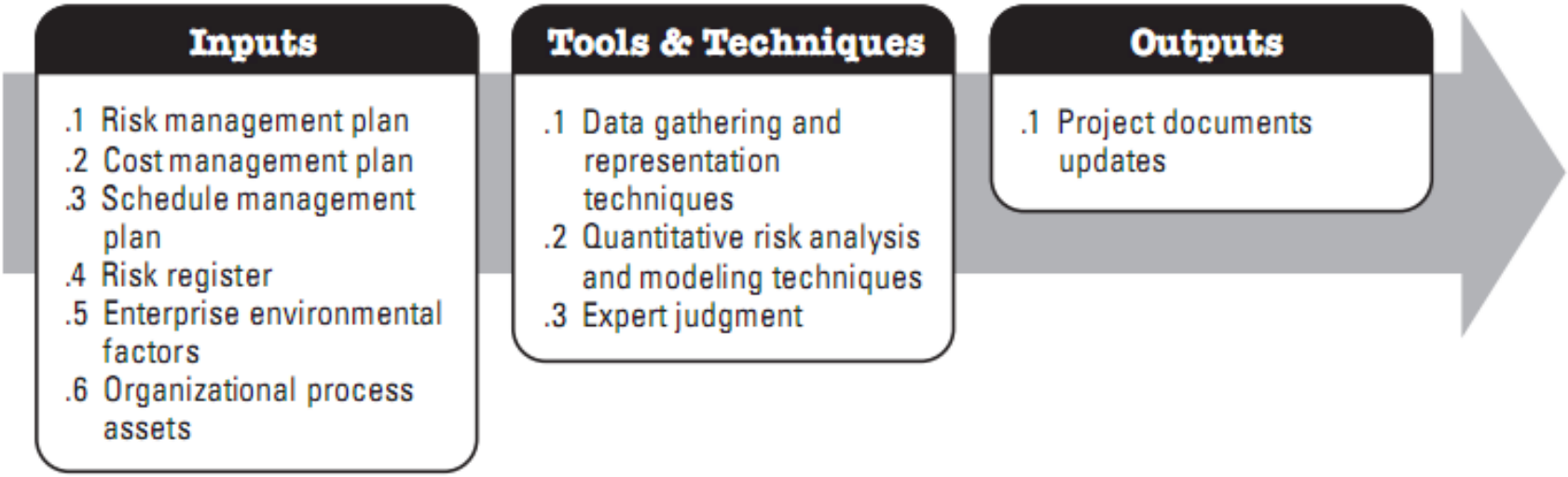
Perform Quantitative Risk Analysis ITTO



Decision Trees and Expected Monetary Value (EMV)

- A **decision tree** is a **diagramming analysis technique** used to help select the best course of action in situations in which future outcomes are uncertain
- **Estimated monetary value (EMV)** is the product of a risk event probability and the risk event's monetary value
- You can draw a decision tree to help find the EMV
- Watchout **EMV** is NOT **EVM**

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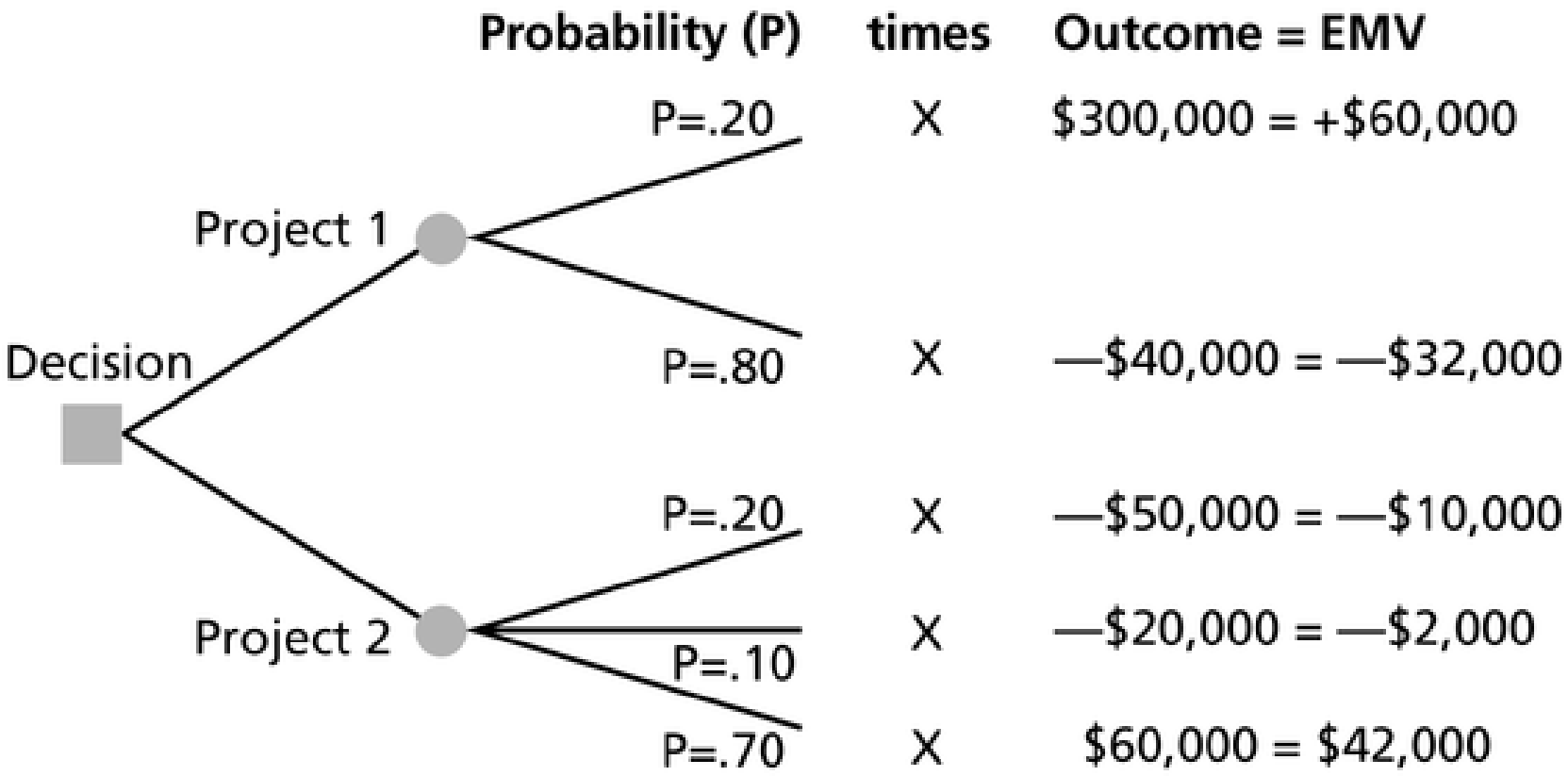
Expected Monetary Value (EMV)



Project 1's EMV = $60,000 —32,000 = $28,000

Project 2's EMV = —$10,000 —2,000 + 42,000 = $30,000

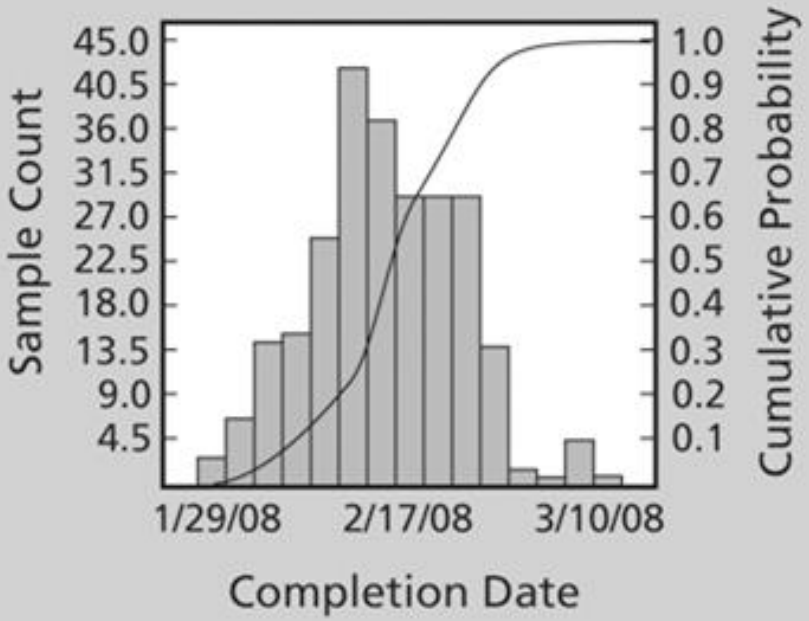
Simulation

- Simulation uses a representation or model of a system to analyze the expected behavior or performance of the system
  - To use a Monte Carlo simulation, you must have three estimates (most likely, pessimistic, and optimistic) plus an estimate of the likelihood of the estimate being between the most likely and optimistic values
- **Monte Carlo analysis** simulates a model's outcome many times to provide a statistical distribution of the calculated results
  - Predicts the probability of finishing by a certain date or that the cost will be equal to or less than a certain value

Sample Monte Carlo Simulation Results for Project Schedule

Date: 1/14/08 11:13:56 AM
Number of Samples: 250
Unique ID: 1
Name: Widget

Completion Std Deviation: 5.2d
95% Confidence Interval: 0.6d
Each bar represents 2d



Completion Probability Table

Prob	Date	Prob	Date
0.05	2/4/08	0.55	2/17/08
0.10	2/8/08	0.60	2/18/08
0.15	2/9/08	0.65	2/19/08
0.20	2/10/08	0.70	2/22/08
0.25	2/11/08	0.75	2/22/08
0.30	2/12/08	0.80	2/23/08
0.35	2/15/08	0.85	2/24/08
0.40	2/15/08	0.90	2/25/08
0.45	2/16/08	0.95	2/26/08
0.50	2/17/08	1.00	3/10/08

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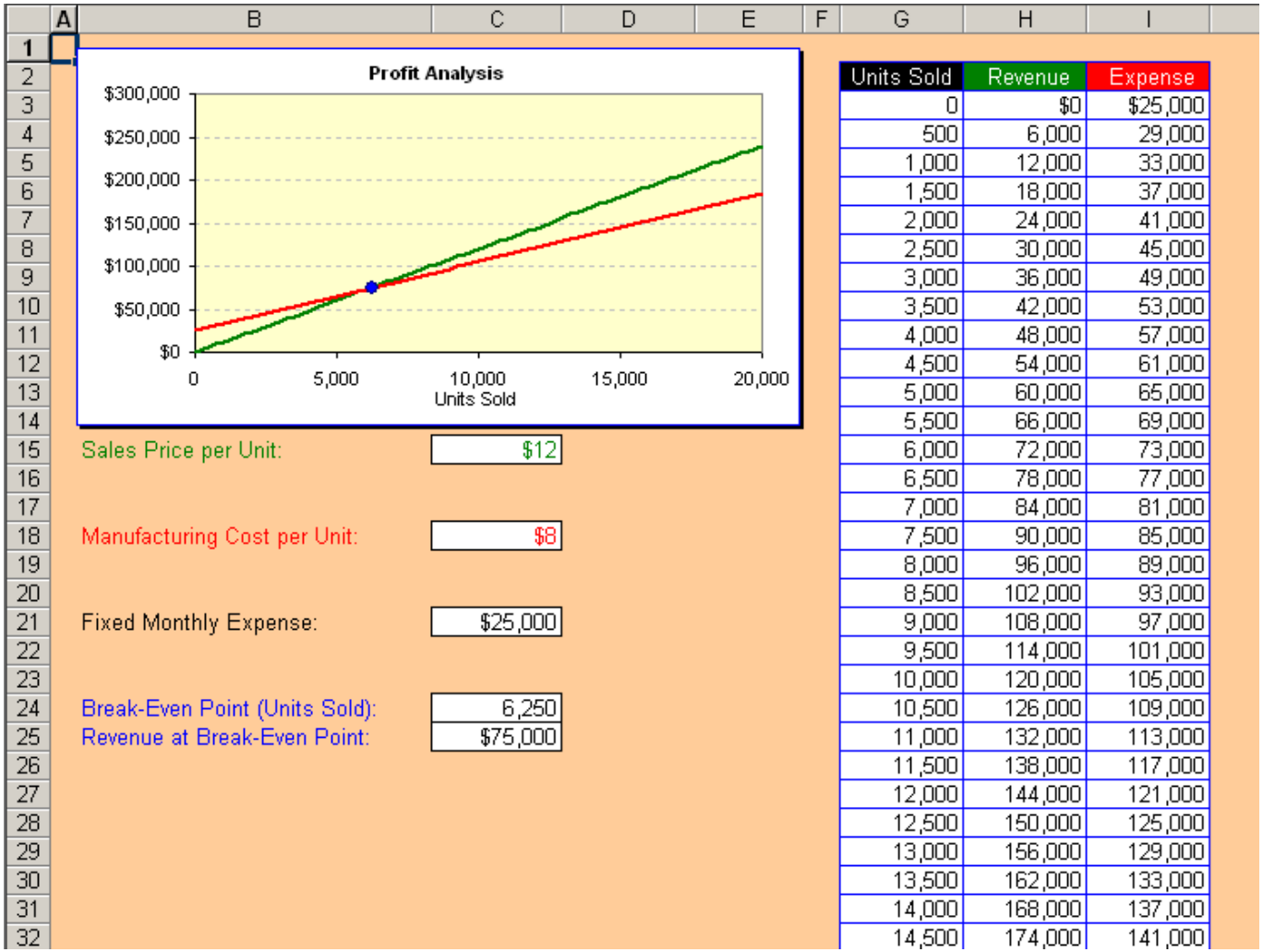
Sensitivity Analysis

- **Sensitivity analysis** is a technique used to show the effects of changing one or more variables on an outcome
- For example, many people use it to determine what the monthly payments for a loan will be given different interest rates or periods of the loan, or for determining break-even points based on different assumptions
- Spreadsheet software, such as Excel, is a common tool for performing sensitivity analysis

Sample Sensitivity Analysis for Determining Break-Even Point



Units Sold	Revenue	Expense
0	$0	$25,000
500	6,000	29,000
1,000	12,000	33,000
1,500	18,000	37,000
2,000	24,000	41,000
2,500	30,000	45,000
3,000	36,000	49,000
3,500	42,000	53,000
4,000	48,000	57,000
4,500	54,000	61,000
5,000	60,000	65,000
5,500	66,000	69,000
6,000	72,000	73,000
6,500	78,000	77,000
7,000	84,000	81,000
7,500	90,000	85,000
8,000	96,000	89,000
8,500	102,000	93,000
9,000	108,000	97,000
9,500	114,000	101,000
10,000	120,000	105,000
10,500	126,000	109,000
11,000	132,000	113,000
11,500	138,000	117,000
12,000	144,000	121,000
12,500	150,000	125,000
13,000	156,000	129,000
13,500	162,000	133,000
14,000	168,000	137,000
14,500	174,000	141,000

Plan Risk Response ITTO

- After identifying and quantifying risks, you must decide how to respond to them

NEGATIVE RISK RESPONSE

- **Four main response** strategies for **negative risks**:
  - **Risk avoidance** – don't use h/w or s/w if unfamiliar with them
  - **Risk acceptance** – prepare for risk with backup plan or contingency reserves
  - **Risk transference** – to deal with financial risk exposure, a company may purchase special insurance for specific h/w needed for a project. If h/w fails, insurer has to replace it.
  - **Risk mitigation** – reduce probability of occurrence e.g., use proven technology, buy maintenance or service contract

H/W -> Hardware; S/W -> Software

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Response Strategies for Positive Risks

- **Risk exploitation** – do whatever you can to make sure the risk occurs, call press conference to advertise new product, take out ads, etc
- **Risk sharing** – allocating ownership of the risk to another party. Hire an outside firm to do your advertising and PR
- **Risk enhancement** – identify and maximize key drivers of the risk. Encourage your employees or users of your product to spread the word of your product
- **Risk acceptance** – don't take any action with regard to positive risk. Assume the product will speak for itself

Residual and Secondary Risks

- It's also important to identify residual and secondary risks
- **Residual risks** are risks that remain after all of the response strategies have been implemented
  - Even though used stable h/w platform, it still may fail
- **Secondary risks** are a direct result of implementing a risk response
  - Using stable h/w may have caused a risk of peripheral devices failing to function properly

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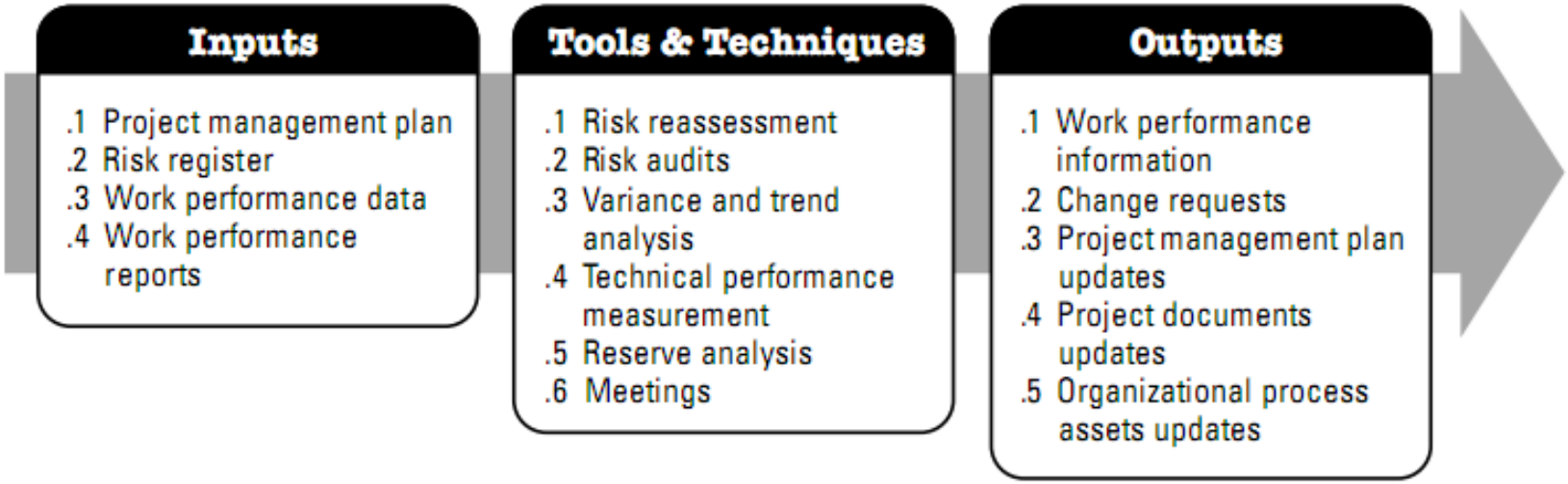
Control Risk ITTO



Risk Monitoring and Control

- Involves executing the risk management process to respond to risk events
  - This is an ongoing activity – new risks identified, old risks disappear, weaken or get stronger
- **Workarounds** are unplanned responses to risk events that must be done when there are no contingency plans
- **Main outputs of risk monitoring and control are**:
  - **Requested changes**
  - **Recommended corrective and preventive actions**
  - **Updates to the risk register, project management plan, and organizational process assets**

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Chapter Summary

- Project risk management is the art and science of identifying, analyzing, and responding to risk throughout the life of a project and in the best interests of meeting project objectives
- Main processes include:
  1. **Plan risk management**
  2. **Identify risks**
  3. **Perform qualitative risk analysis**
  4. **Perform quantitative risk analysis**
  5. **Plan risk responses**
  6. **Control risks**

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References

1. Kathy Schwalbe, Managing Information Technology Projects 7th Edition, *Course Technology, Cengage Learning*, 2014
2. A Guide to the Project Management Body of Knowledge: PMBOK Guide 6th Edition, *Project Management Institute*, 2017