Project Risk Management

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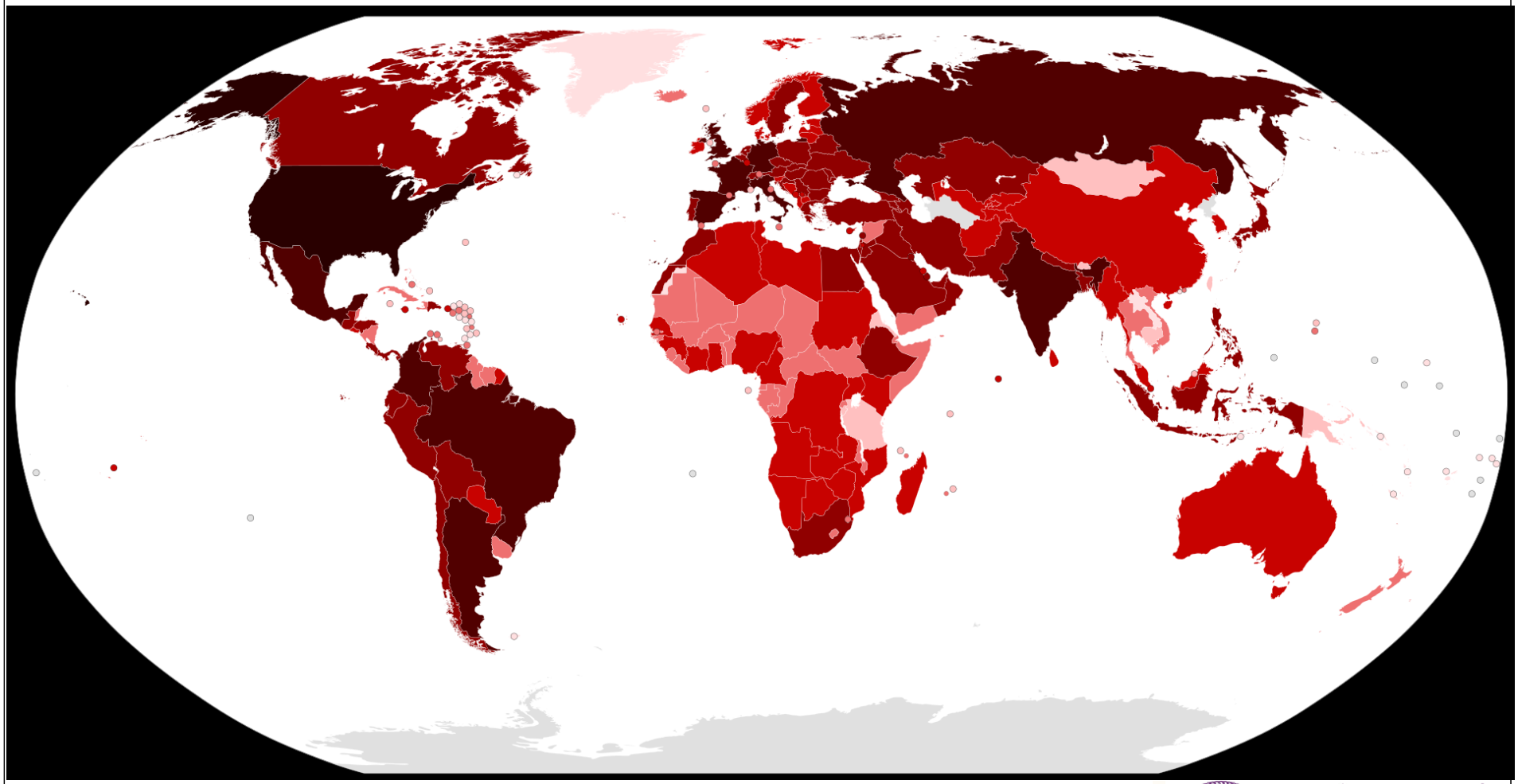
Contents

- The Importance
- Plan Risk Management
- Identify Risks
- Perform Qualitative Risk Analysis
- Perform Quantitative Risk Analysis
- Plan Risk Responses
- Implement Risk Responses
- Monitor Risks
- Software Assistance

Total confirmed cases per country as of 1 December 2020



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Risk vs Crisis

Protection

Recovery

Risks in Projects

- Scope creep
- Overdue
- Over budget
- Bad quality
- People quit
- ……

David Hillson (2008)

There is no doubt that all sectors of industry and society are facing real challenges in coping with the current fallout from the credit crunch. But risk management should not be regarded as a nonessential cost to be cut in these difficult times. ... . **Rather than treating risk management as part of the problem, we should see it as a major part of the solution**.

Definition of Risk

An **uncertainty** that can have a **negative** or **positive** effect on meeting project objectives. Risk is the **product** of **probability** and **consequence**.

Threat:	*Opportunity:*
Any uncertainty that, if it occurs, would affect one or more objectives negatively	Any uncertainty that, if it occurs, would affect one or more objectives positively

Negative Risk

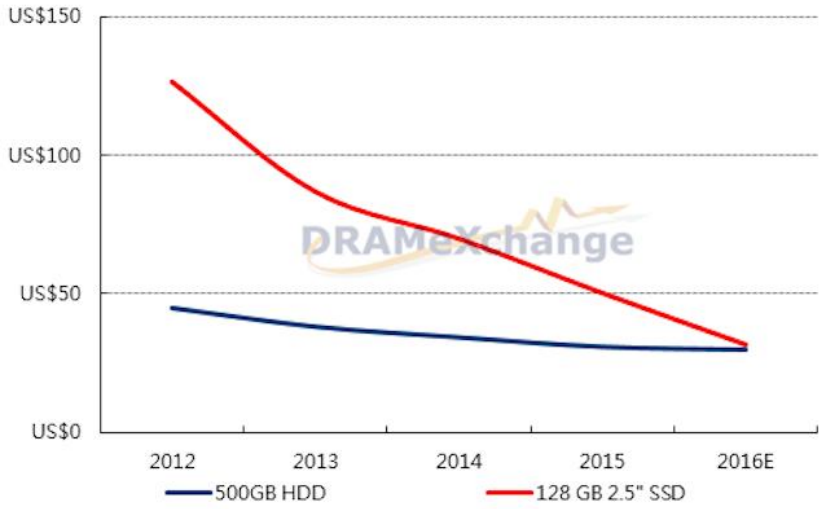
- A dictionary definition of risk is “the possibility of loss or injury.”
- Managing negative risks involves a number of possible actions that project managers can take to avoid, lessen, change, or accept the potential effects of risks on their projects.
- Negative risk management is like insurance; it is an investment.

Risk Can Be Positive

- Positive risks are risks that result in good things happening; sometimes called opportunities.

- The goal of project risk management is to minimize potential negative risks while maximizing potential positive risks.

Figure: 128GB SSD and 500GB HDD Price Trends, 2012~2016



Source : DRAMeXchange, Mar., 2016

Tow Levels of Risks

- Individual project risk: an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives

- Overall project risk: 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.

Event and Non-event Risks

- Event-based risks: a key seller may go out of business during the project
- Non-event risks
  - Variability risk: Uncertainty exists about some key characteristics of a planned event or activity or decision. Examples: productivity may be above or below target, the number of bugs found may be higher or lower than expected
  - Ambiguity risk: Uncertainty exists about what might happen in the future. Areas of the project where imperfect knowledge might affect the project's ability to achieve its objectives include: elements of the requirement or technical solution

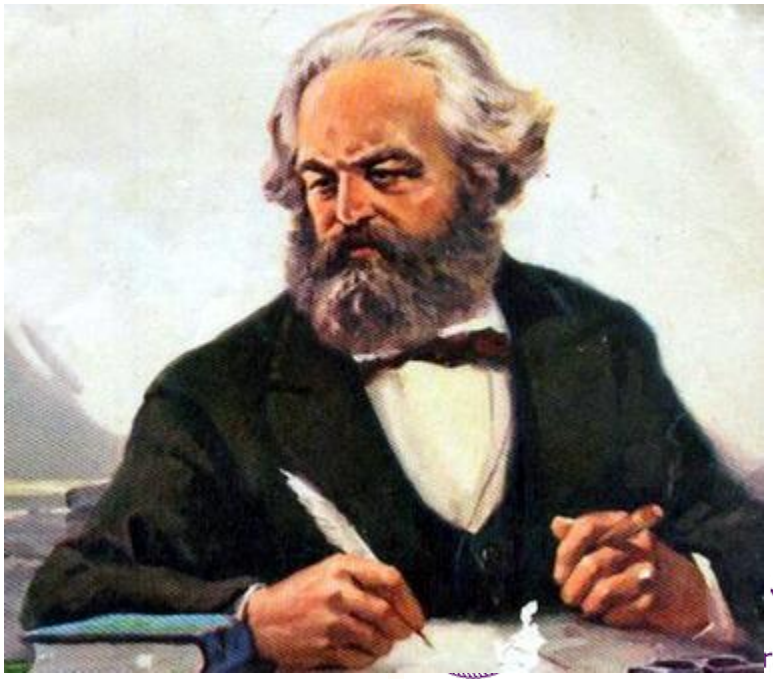
Profit and Risk

10% will ensure its employment anywhere;

20% certain will produce eagerness; 50%, positive audacity;

100% will make it ready to trample on all human laws;

300%, and there is not a crime at which it will scruple, nor a risk it will not run, even to the chance of its owner being hanged.



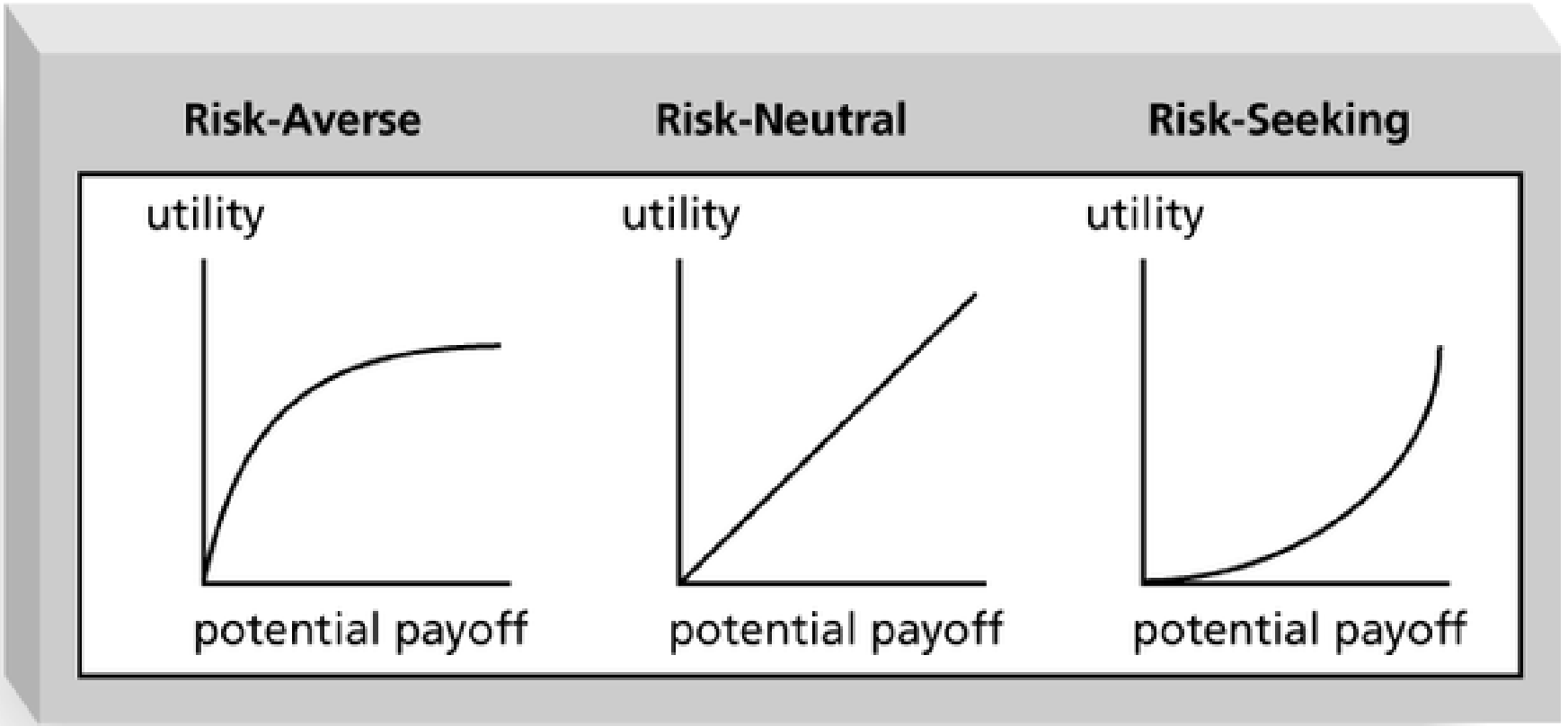
- **Risk appetite**: the degree of uncertainty an entity is willing to take on, in anticipation of a reward

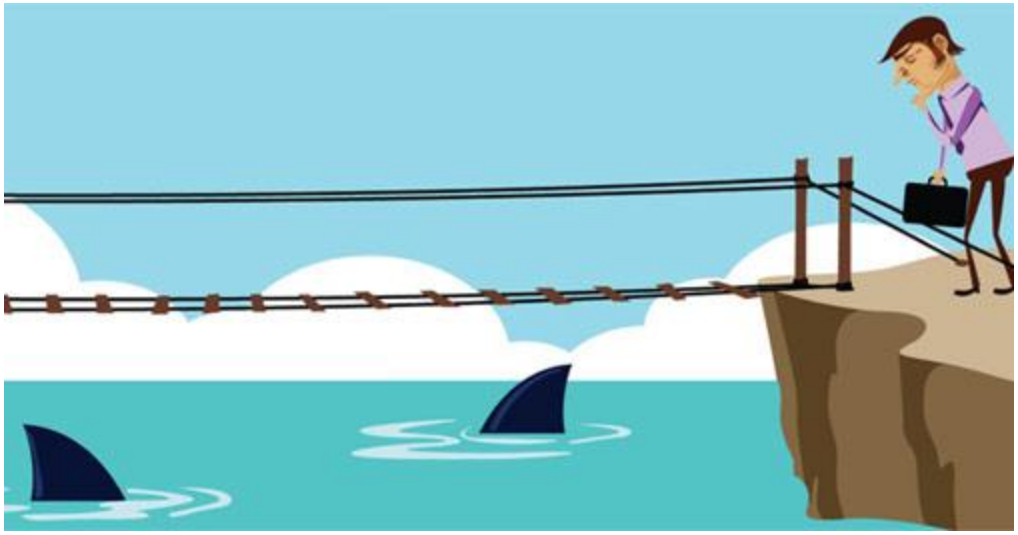
- **Risk tolerance**: the maximum acceptable deviation an entity is wiling to accept on the project or business objectives as the potential impact

Risk Utility

- Risk utility 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.

Risk Utility Function and Risk Preference

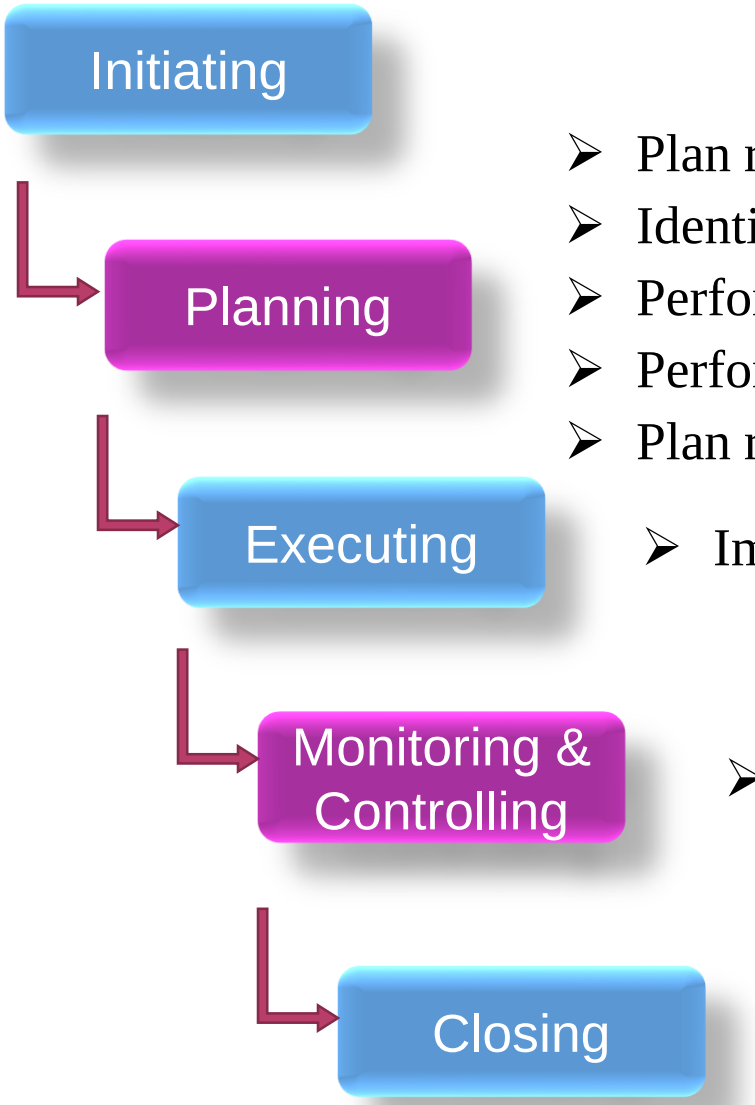




Project Risk Management

The processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project

The objectives are to increase the probability and/or impact of positive risks and to decrease the probability and/or impact of negative risks, in order to optimize the changes of project success



- Plan risk management
- Identify risks
- Perform qualitative risk analysis
- Perform quantitative risk analysis
- Plan risk responses

- Implement risk responses

- Monitor risks

Contents

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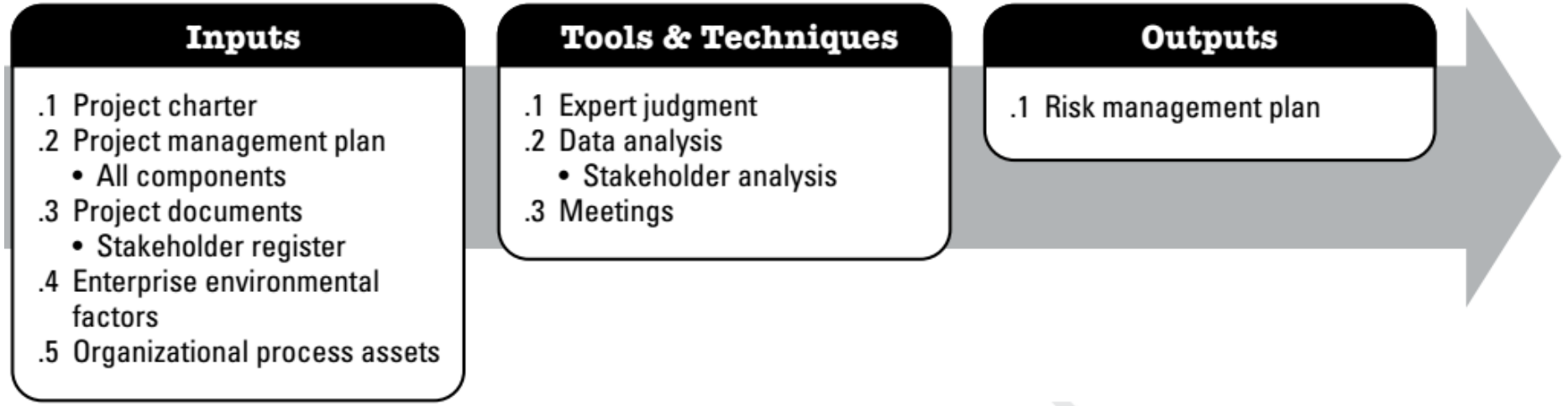
Plan Risk Management

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.

Plan Risk Management



Concepts

- **Contingency plans** are predefined actions that the project team will take if an identified risk event occurs.
- **Fallback plans** are 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.
- **Contingency reserves** or **allowances** are provisions held by the project sponsor or organization to reduce the risk of cost or schedule overruns to an acceptable level.
- **Management reserves** are funds held for unknown risks

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 and understand the organization's and the sponsor's approaches to risk.
- The level of detail will vary with the needs of the project.

Risk Management Plan

- Risk strategy
- Methodology
- Role and responsibilities
- Funding
- Timing
- Risk categories
- Stakeholder risk appetite
- Definitions of risk probability and impacts
- Probability and impact matrix
- Reporting formats
- Tracking

Example of Definitions for Probability and Impacts

SCALE	PROBABILITY	+/− IMPACT ON PROJECT OBJECTIVES		
		TIME	COST	QUALITY
Very High	>70%	>6 months	>$5M	Very significant impact on overall functionality
High	51-70%	3-6 months	$1M-$5M	Significant impact on overall functionality
Medium	31-50%	1-3 months	$501K-$1M	Some impact in key functional areas
Low	11-30%	1-4 weeks	$100K-$500K	Minor impact on overall functionality
Very Low	1-10%	1 week	<$100K	Minor impact on secondary functions
Nil	<1%	No change	No change	No change in functionality

Common Sources of Risk in Information Technology Projects

1. The **Standish Group** developed an IT success potential scoring sheet based on potential.

2. Other broad categories of risk help identify potential risks.

What helps projects succeed?

Factors of Success	Points
Executive sponsorship	15
Emotional maturity	15
User involvement	15
Optimization	15
Skilled resources	10
Agile process	7
Modest execution	6
Project management expertise	5
Clear business objectives	4

Source: The Standish Group, "CHAOS Manifesto 2015" (2015)

Specific Questions for User Involvement

- Do I have the right users?
- Did I involve the users early and often?
- Do I have a quality relationship with the users?
- Do I make involvement easy?
- Did I find out what the users need?

Broad Categories of Risk

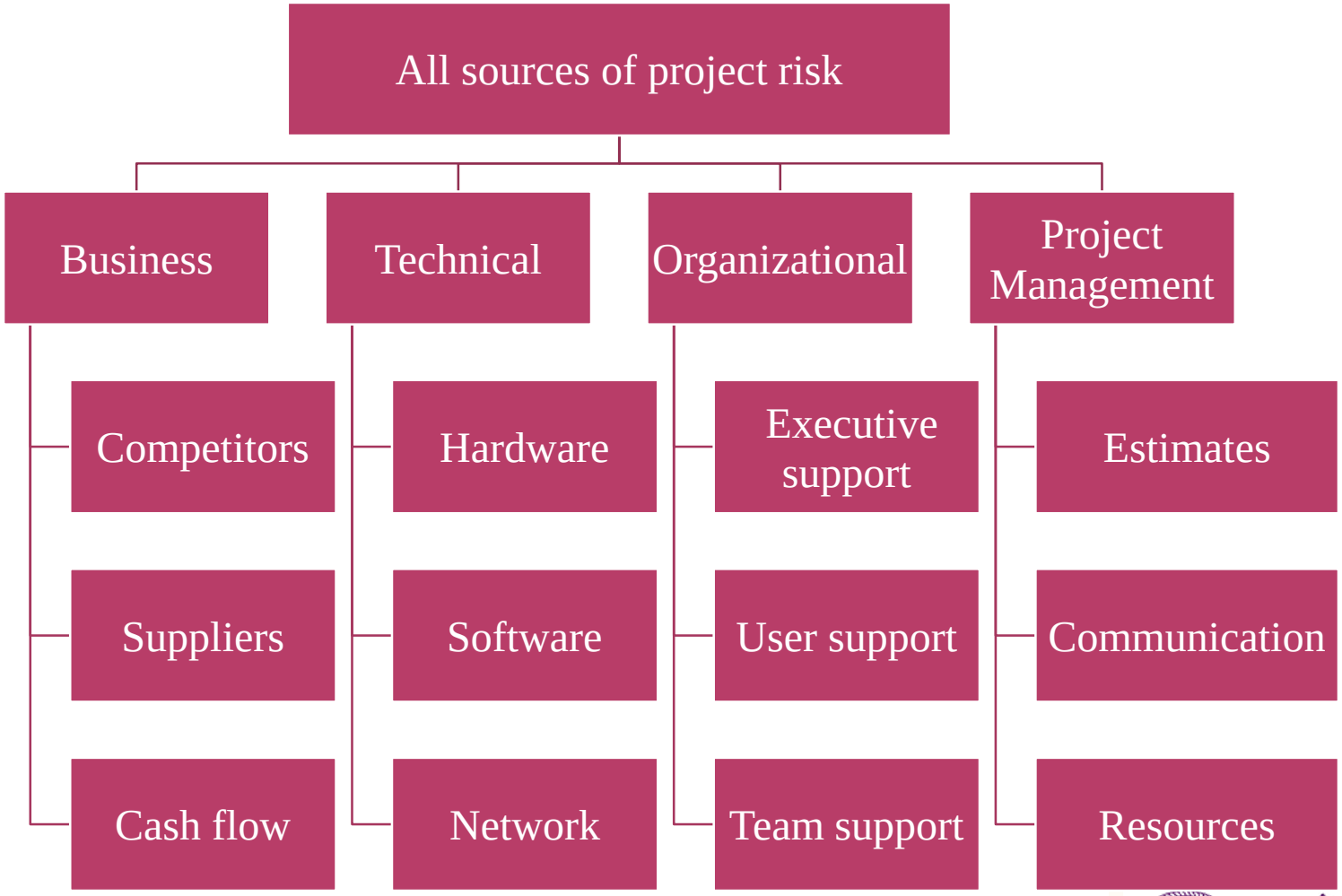
- Market risk
- Financial risk
- Technology risk
- People risk
- Structure/process risk

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.

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 of quality requirements; inadequate scope control
Time	Errors in estimating time or resource availability; poor allocation and management of float; early release of competitive products
Cost	Estimating errors; inadequate productivity, cost, change, or contingency control; poor maintenance, security, purchasing, etc.
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;
Risk	Ignoring risk; unclear assignment of risk; poor insurance management
Procurement	Unenforceable conditions or contract clauses; adversarial relations
Stakeholders	Lack of consultation with key stakeholders

Source: R.M. Wideman

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Identify Risks

The process of identifying individual project risks as well as sources of overall project risk, and documenting their characteristics

The key benefit of this process is the documentation of existing individual project risks and the sources of overall project risk.

Inputs	Tools & Techniques	Outputs
.1 Project management plan • Requirements management plan • Schedule management plan • Cost management plan • Quality management plan • Resource management plan • Risk management plan • Scope baseline • Schedule baseline • Cost baseline .2 Project documents • Assumption log • Cost estimates • Duration estimates • Issue log • Lessons learned register • Requirements documentation • Resource requirements • Stakeholder register .3 Agreements .4 Procurement documentation .5 Enterprise environmental factors .6 Organizational process assets	.1 Expert judgment .2 Data gathering • Brainstorming • Checklists • Interviews .3 Data analysis • Root cause analysis • Assumption and constraint analysis • SWOT analysis • Document analysis .4 Interpersonal and team skills • Facilitation .5 Prompt lists .6 Meetings	.1 Risk register .2 Risk report .3 Project documents updates • Assumption log • Issue log • Lessons learned register

- Risk owners for individual project risks may be nominated as part of the Identify Risk process, and will be confirmed during the Perform Qualitative Risk Analysis process
- Preliminary risk responses may also be identified and recorded and will be reviewed and confirmed as part of the Plan Risk Responses process

Tools

- Brainstorming
- The Delphi Technique
- Interviewing
- Influence diagram
- Root cause analysis
- SWOT analysis

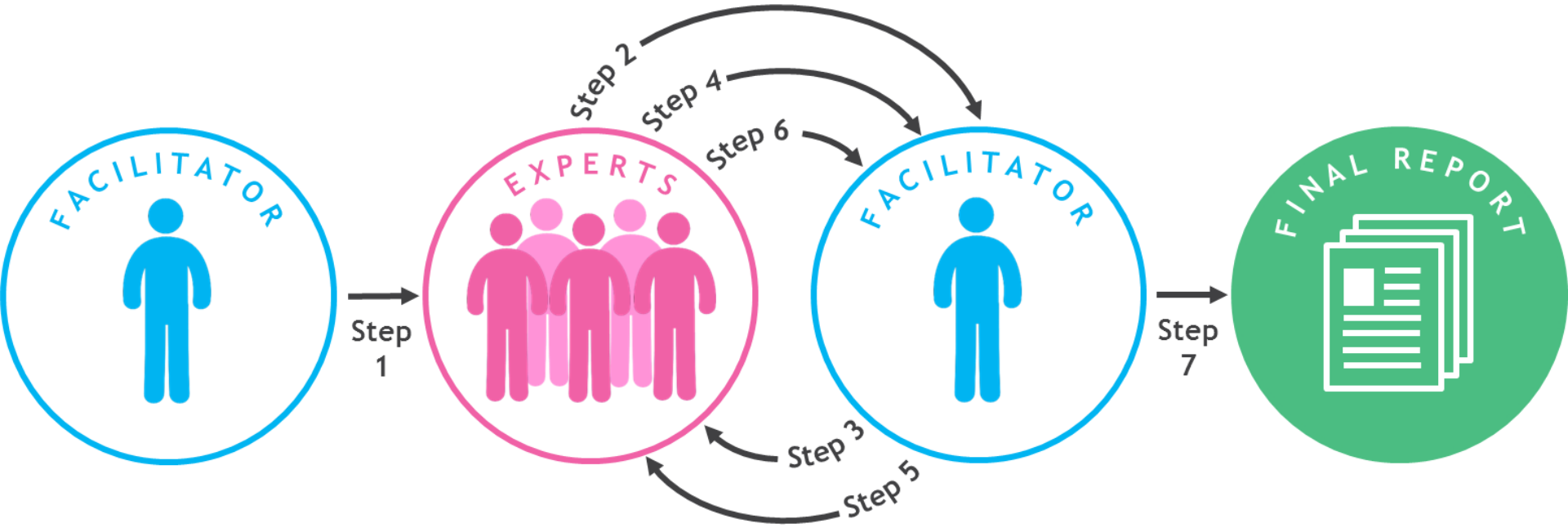
Brainstorming

- **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.

Particular Attention in Brainstorming

Risks identified through brainstorming are clearly described, since the technique can result in ideas that are not fully formed.

Delphi Technique



Facilitator seeks individual assessments from a pool of experts.

Experts respond to the request, receive feedback and revise their responses.

Facilitator compiles the responses and sends a revised set of questions to each expert. Several cycles of feedback may be needed.

Facilitator produces report on experts' responses, noting key outliers.

Delphi Technique

- The **Delphi Technique** is used to derive a consensus among a panel of experts who make predictions about future developments.
- 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.

Interviewing

- **Interviewing** is a fact-finding technique for collecting information in face-to-face, phone, e-mail, or instant-messaging discussions.

- Interviewing people with similar project experience is an important tool for identifying potential risks.

Root Cause Analysis

SWOT Analysis

- SWOT analysis (strengths, weaknesses, opportunities, and threats) can also be used during risk identification.

- Helps identify the **broad** negative and positive risks that apply to a project.

More Tools

- **Checklist** – a list based on the risks encountered in previous projects provide a meaningful template for understanding risks in a current project
- **Diagramming** – flowcharts

Risk Register

- The main output of the risk identification
- 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 Event

- **Risk events** refer to specific, uncertain events that may occur to the detriment or enhancement of the project.
- **Negative risk events**: performance failure, delays in scheduled work, increases in estimated cost, supply shortage, litigation against the company, and strikes
- **Positive risk events**: completing work sooner or cheaper than planned, collaborating with suppliers to produce better products, good publicity resulting from the project

Risk Register Contents

1. An identification number for each risk event.
2. A rank for each risk event.
3. The name of each risk event.
4. A description of each risk event.
5. The category under which each risk event falls.
6. The root cause of each risk.

Risk Register Contents (cont'd)

7. Triggers for each risk; **triggers** are indicators or symptoms of actual risk events.
8. Potential responses to each risk.
9. The potential **risk owner** or person who will own or take responsibility for each risk.
10. The probability and impact of each risk occurring.
11. 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										

No.: R44
Rank: 1
Risk: New customer
Description: We have never done a project for this organization before and don't know too much about them. One of our company's strengths is building good customer relationships, which often leads to further projects with that customer. We might have trouble working with this customer because they are new to us.
Category: People risk
Root cause: We won a contract to work on a project without really getting to know the customer.
Triggers: The project manager and other senior managers realize that we don't know much about this customer and could easily misunderstand their needs or expectations.
Potential responses: Make sure the project manager is sensitive to the fact that this is a new customer and takes the time to understand them. Have the PM set up a meeting to get to know the customer and clarify their expectations. Have Cliff attend the meeting, too.
Risk owner: Our project manager
Probability: Medium
Impact: High
Status: PM will set up the meeting within the week.

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Perform Qualitative Risk Analysis

The process of prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact as well as other characteristics

Key benefits: it focuses efforts on high-priority risks

Lays the foundation for Perform Quantitative Risk Analysis

Inputs	Tools & Techniques	Outputs
.1 Project management plan • Risk management plan .2 Project documents • Assumption log • Risk register • Stakeholder register .3 Enterprise environmental factors .4 Organizational process assets	.1 Expert judgment .2 Data gathering • Interviews .3 Data analysis • Risk data quality assessment • Risk probability and impact assessment • Assessment of other risk parameters .4 Interpersonal and team skills • Facilitation .5 Risk categorization .6 Data representation • Probability and impact matrix • Hierarchical charts .7 Meetings	.1 Project documents updates • Assumption log • Issue log • Risk register • Risk report

Qualitative Risk Analysis

Assess the likelihood and impact of identified risks to determine their magnitude and priority.

Risk qualitative tools and techniques include:

1. Probability/impact matrixes
2. The Top Ten Risk Item Tracking
3. Risk Management Review
4. Expert judgment

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.
- 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.

Sample Probability/Impact Matrix

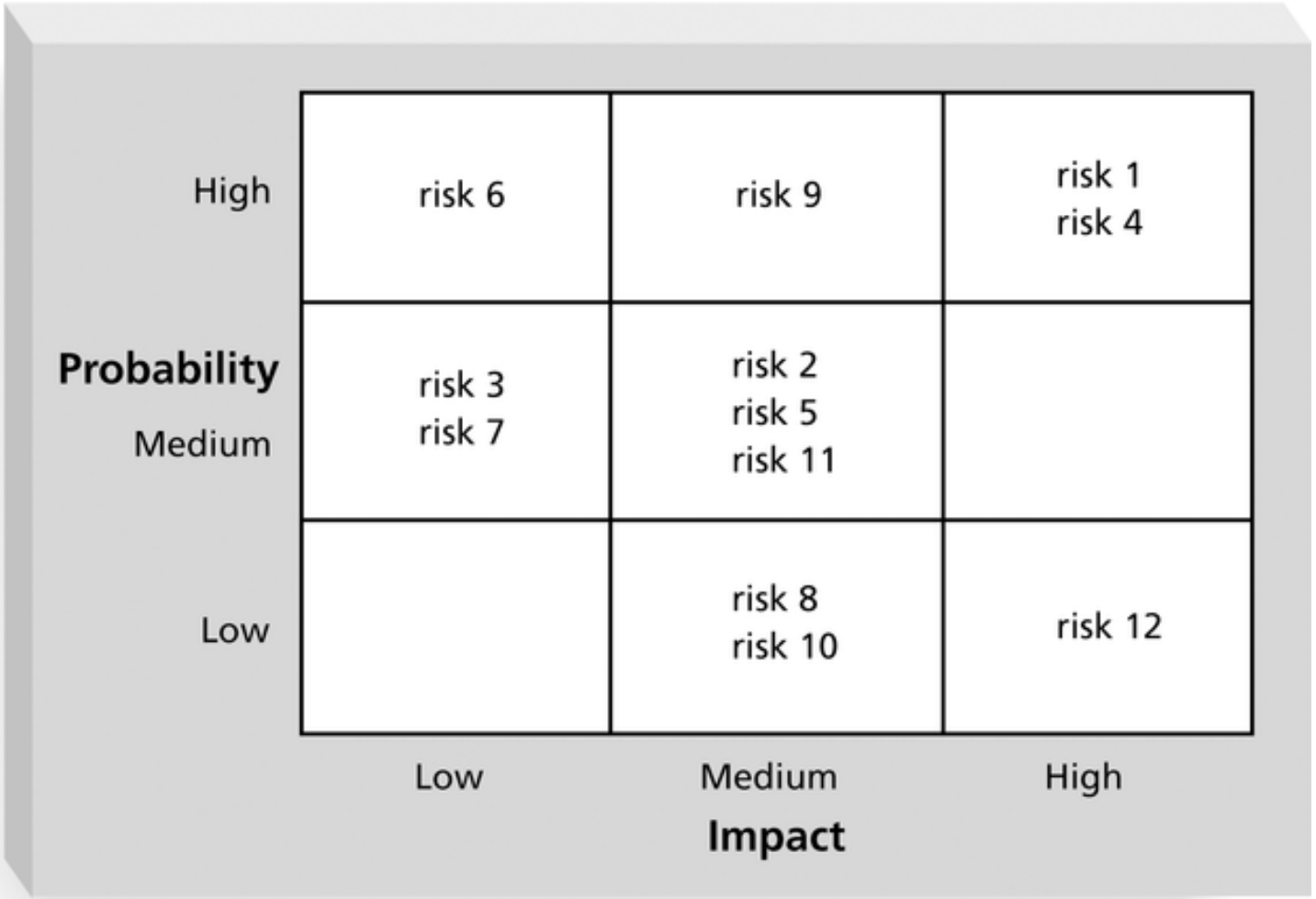
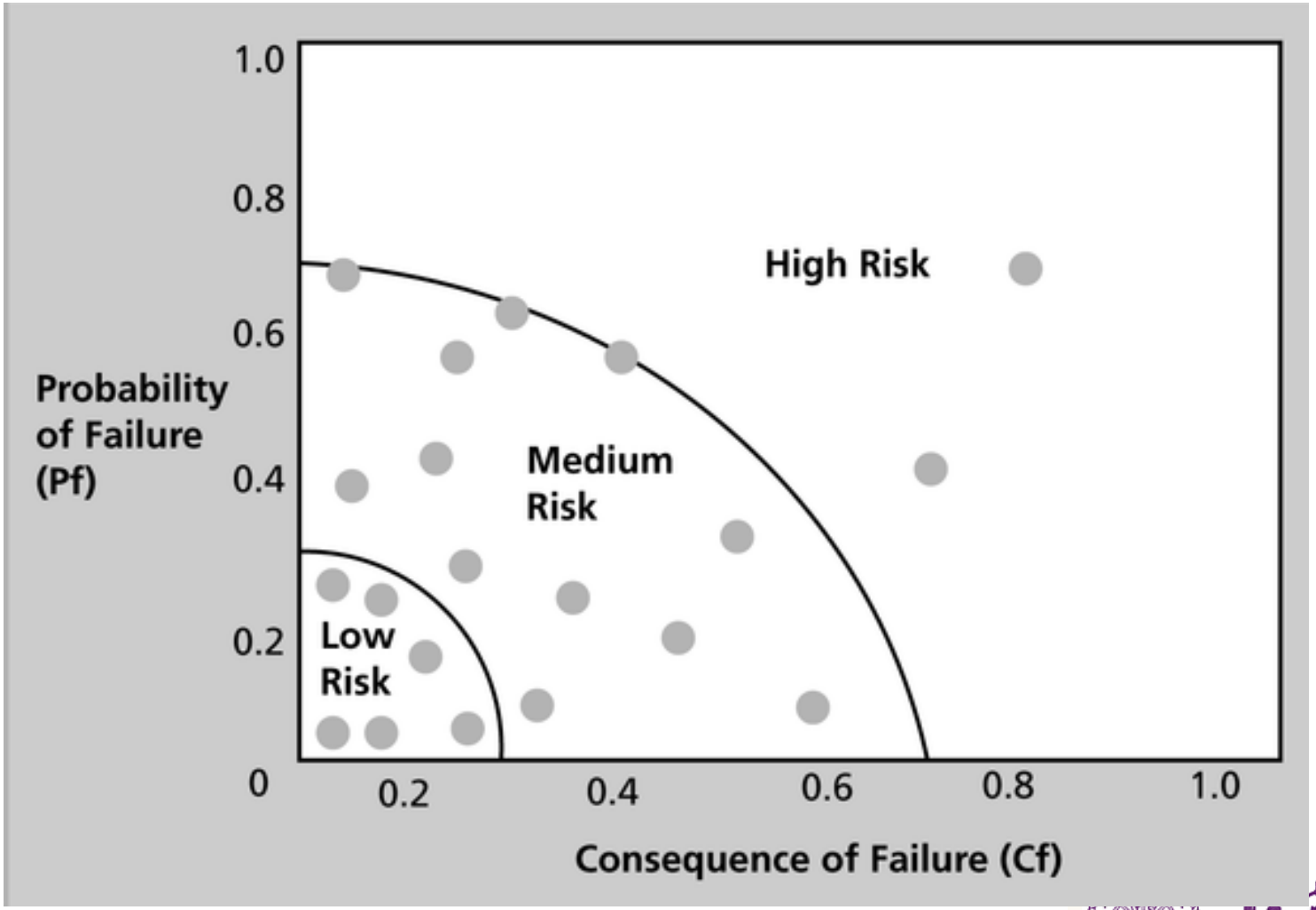


Chart Showing High-, Medium-, and Low-Risk Technologies



Probability	Threats					Opportunities				
0.90	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05
0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04
0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03
0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02
0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01
	0.05/ Very Low	0.10/ Low	0.20/ Moderate	0.40/ High	0.80/ Very High	0.80/ Very High	0.40/ High	0.20/ Moderate	0.10/ Low	0.05/ Very Low

PROBABILITY OF FAILURE (P_F) ATTRIBUTES OF SUGGESTED TECHNOLOGY

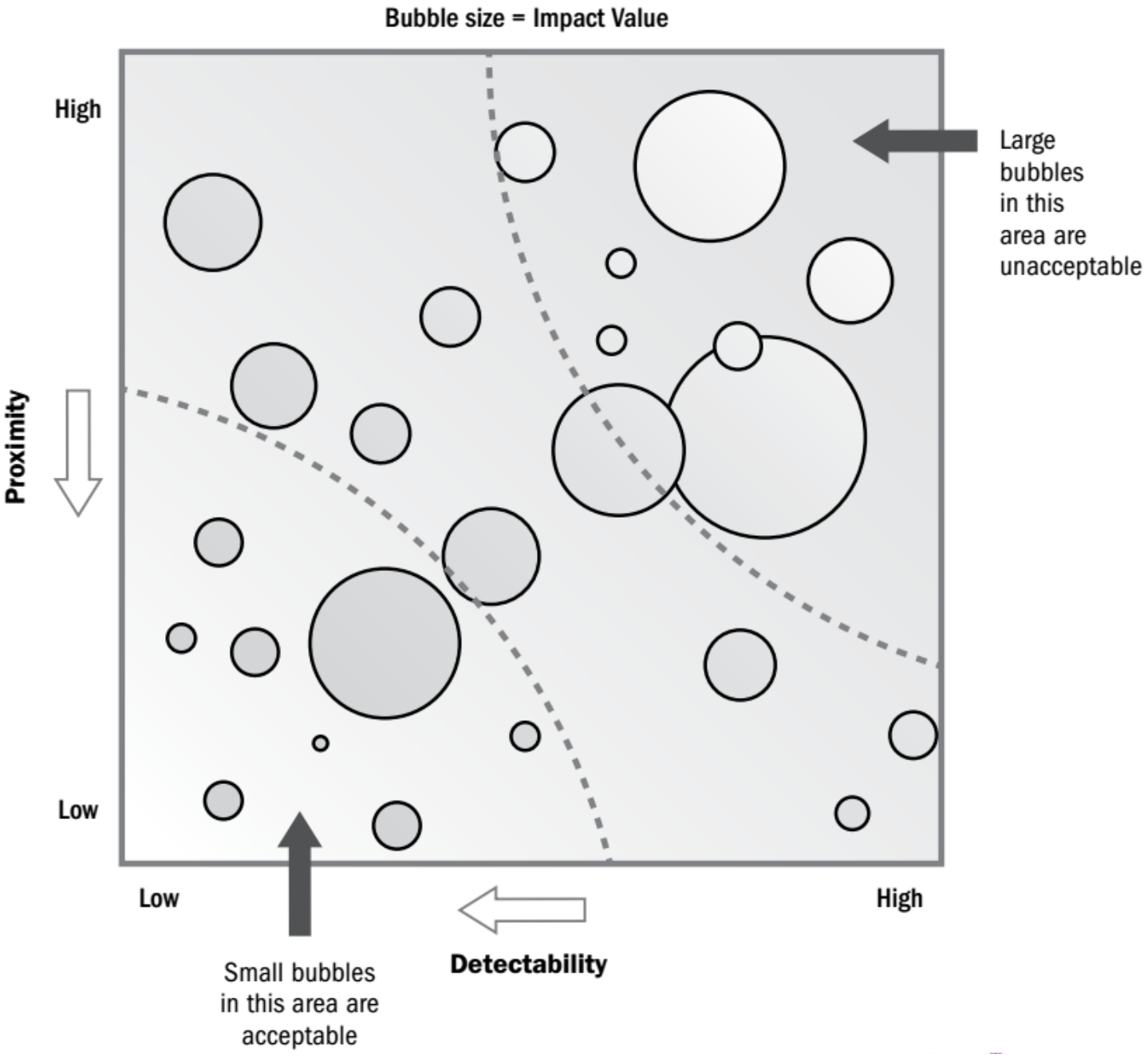
Value	Maturity Hardware/Software	Complexity Hardware/Software	Support Base
0.1	Existing	Simple Design	Multiple Programs And Services
0.3	Minor Redesign	Somewhat Complex	Multiple Programs
0.5	Major Change Feasible	Fairly Complex	Several Parallel Programs
0.7	Complex HW Design/ New SW Similar to Existing	Very Complex	At Least One Other Program
0.9	Some Research Completed/ Never Done Before	Extremely Complex	No Additional Programs

CONSEQUENCE OF FAILURE (C_F) ATTRIBUTES OF SUGGESTED TECHNOLOGY

Value	Fallback Solutions	Life Cycle Cost (LCC) Factor	Schedule Factor (Initial Operational Capability = IOC)	Downtime (DT) Factor
0.1	Several Acceptable Alternatives	Highly Confident Will Reduce LCC	90—100% Confident Will Meet IOC Significantly	Highly Confident Will Reduce DT
0.3	A Few Known Alternatives	Fairly Confident Will Reduce LCC	75—90% Confident Will Meet IOC	Fairly Confident Will Reduce DT Significantly
0.5	Single Acceptable Alternative	LCC Will Not Change Much	50—75% Confident Will Meet IOC	Highly Confident Will Reduce DT Somewhat
0.7	Some Possible Alternatives	Fairly Confident Will Increase LCC	25—50% Confident Will Meet IOC	Fairly Confident Will Reduce DT Somewhat
0.9	No Acceptable Alternatives	Highly Confident Will Increase LCC	0—25% Confident Will Meet IOC	DT May Not Be Reduced Much

Other Characteristics

- Urgency
- Proximity
- Dormancy
- Manageability
- Controllability
- Detectability
- Connectivity
- Strategic impact
- Propinquity


Bubble size = Impact Value
High
Proximity
Low
Large bubbles in this area are unacceptable
Low
High
Detectability
Small bubbles in this area are acceptable

Top Ten Risk Item Tracking

- **Top Ten Risk Item Tracking** is a qualitative risk analysis tool that helps to identify risks and maintain an awareness of risks throughout the life of a project.
- Establish a periodic review of the top ten project risk items.
- List the current ranking, previous ranking, number of times the risk appears on the list over a period of time, and a summary of progress made in resolving the risk item.

	Monthly Ranking			
Risk Item	**This Month**	**Last Month**	**Number of Months**	**Risk Resolution Progress**
Inadequate planning	1	2	4	Working on revising the entire project plan
Poor definition of scope	2	3	3	Holding meetings with project customer and sponsor to clarify scope
Absence of leadership	3	1	2	Just assigned a new project manager to lead the project after old one quit
Poor cost estimates	4	4	3	Revising cost estimates
Poor time estimates	5	5	3	Revising schedule estimates

Risk Management Review

1. Keep management and the customer (if included) aware of major influences that could prevent or enhance the project's success
2. By involving the customer, the project team may be able to consider alternative strategies for addressing the risks
3. Promotes confidence in the project team by demonstrating to management and customer that the team is aware of significant risks, has a strategy in place, and is effectively carrying out that strategy

Expert Judgment

- Many organizations rely on the **intuitive feelings** and **past experience** of experts to help identify potential project risks.
- Experts can categorize risks as high, medium, or low with or without more sophisticated techniques.
- Can also help create and monitor a **watch list**, a list of risks that are low priority, but are still identified as potential risks.

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Perform Quantitative Risk Analysis

The process of numerically analyzing the combined effect of identified individual risks and other sources of uncertainty on overall project objectives.

Key benefit: it quantifies overall project risk exposure, and it can also provide additional quantitative risk information to support risk response planning

Inputs	Tools & Techniques	Outputs
.1 Project management plan • Risk management plan • Scope baseline • Schedule baseline • Cost baseline .2 Project documents • Assumption log • Basis of estimates • Cost estimates • Cost forecasts • Duration estimates • Milestone list • Resource requirements • Risk register • Risk report • Schedule forecasts .3 Enterprise environmental factors .4 Organizational process assets	.1 Expert judgment .2 Data gathering • Interviews .3 Interpersonal and team skills • Facilitation .4 Representations of uncertainty .5 Data analysis • Simulations • Sensitivity analysis • Decision tree analysis • Influence diagrams	.1 Project documents updates • Risk report

Quantitative Risk Analysis

- Often follows qualitative risk analysis, but both can be done together.
- Large, complex projects involving leading edge technologies often require extensive quantitative risk analysis.

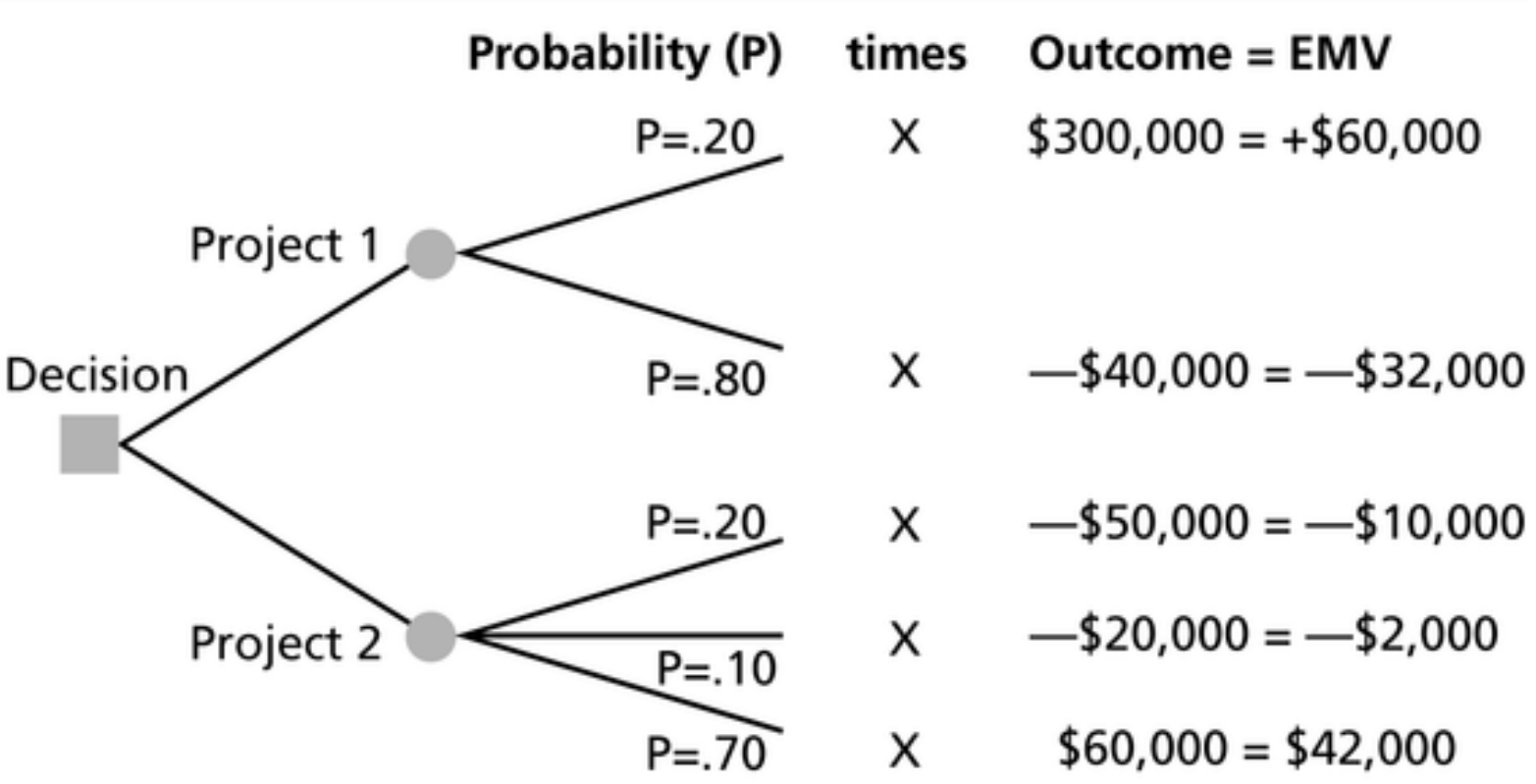
Main techniques include:

1. Decision tree analysis
2. Simulation
3. Sensitivity analysis
4. Tornado Diagram

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.

EMV Example



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.
- Monte Carlo analysis simulates a model's outcome many times to provide a statistical distribution of the calculated results.
- 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.

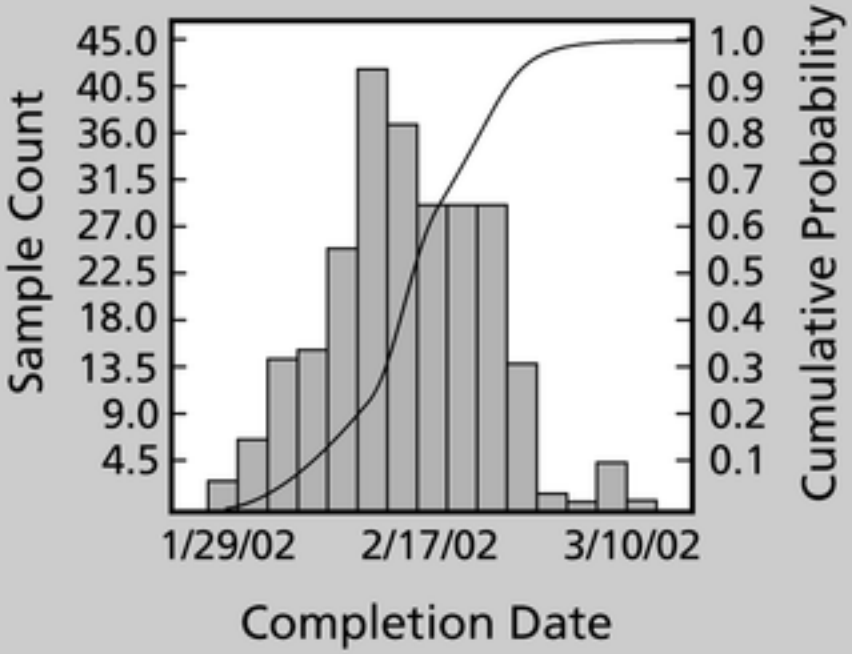
Steps of a Monte Carlo Analysis

1. Assess the range for the variables being considered.
2. Determine the probability distribution of each variable.
3. For each variable, select a random value based on the probability distribution.
4. Run a deterministic analysis or one pass through the model.
5. Repeat steps 3 and 4 many times to obtain the probability distribution of the model's results.

Sample Monte Carlo Simulation Results for Project Schedule

Date: 4/14/02 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



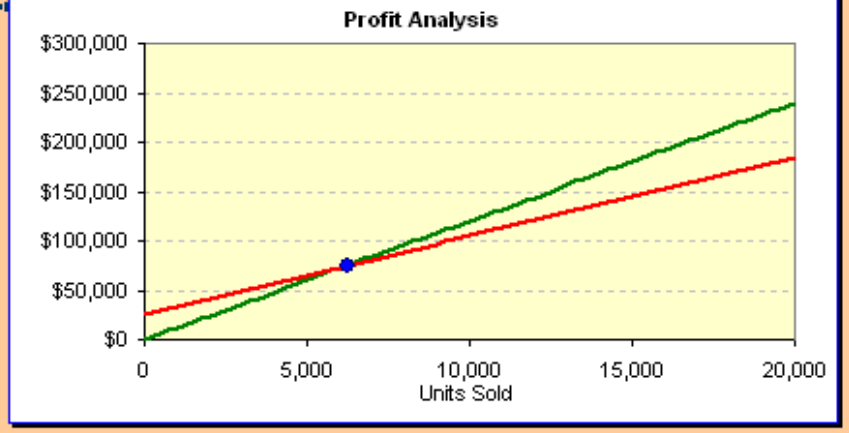
Completion Probability Table

Prob	Date	Prob	Date
0.05	2/4/02	0.55	2/17/02
0.10	2/8/02	0.60	2/18/02
0.15	2/9/02	0.65	2/19/02
0.20	2/10/02	0.70	2/22/02
0.25	2/11/02	0.75	2/22/02
0.30	2/12/02	0.80	2/23/02
0.35	2/15/02	0.85	2/24/02
0.40	2/15/02	0.90	2/25/02
0.45	2/16/02	0.95	2/26/02
0.50	2/17/02	1.00	3/10/02

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.

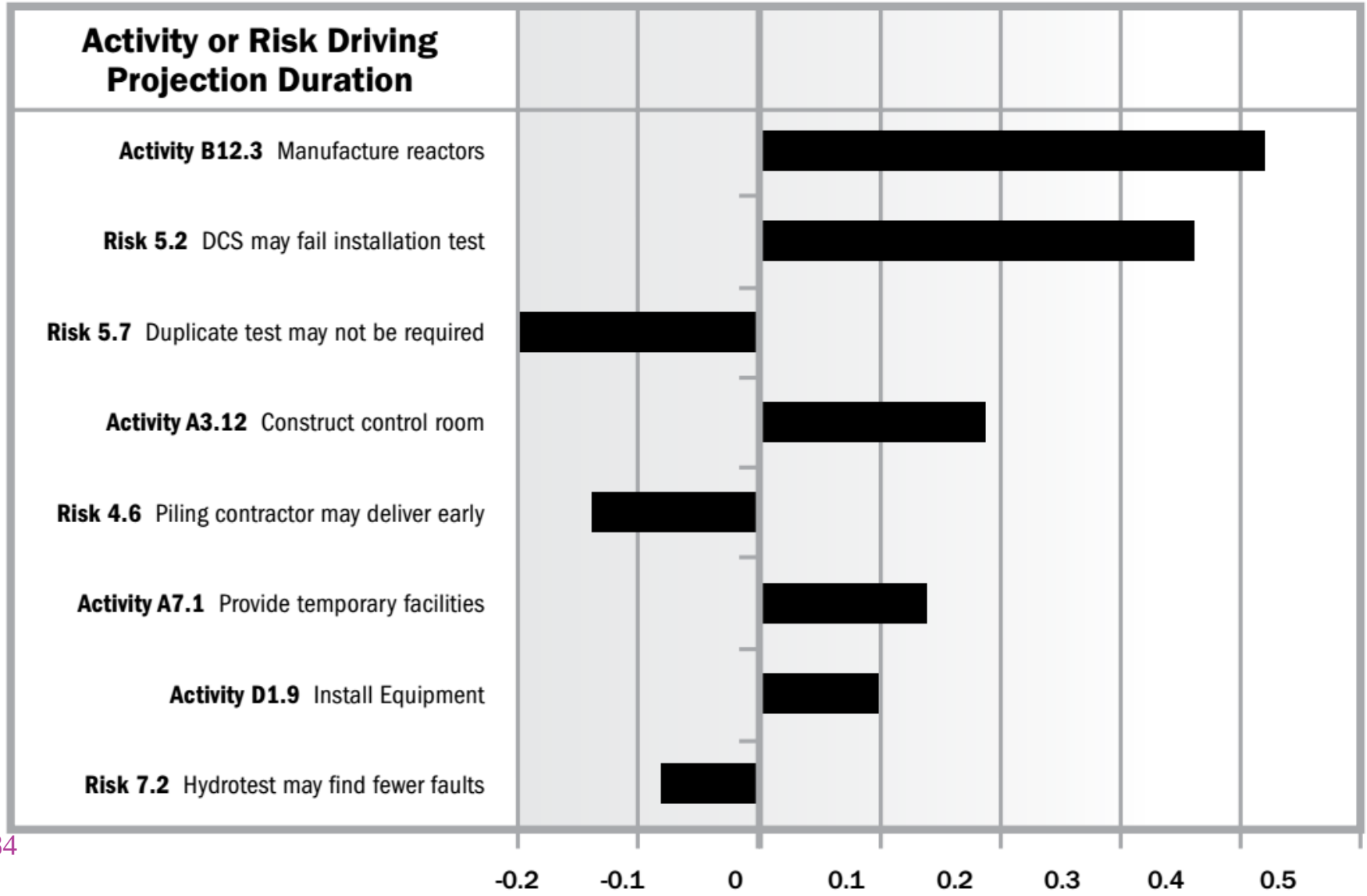
Sample Sensitivity Analysis for Determining Break-Even Point



Sales Price per Unit:	$12
Manufacturing Cost per Unit:	$8
Fixed Monthly Expense:	$25,000
Break-Even Point (Units Sold):	6,250
Revenue at Break-Even Point:	$75,000

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

Tornado Diagram



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- The Importance
- Plan Risk Management
- Identify Risks
- Perform Qualitative Risk Analysis
- Perform Quantitative Risk Analysis
- Plan Risk Responses
- Implement Risk Responses
- Monitor Risks
- Software Assistance

Plan Risk Responses

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

Key benefit: it identifies appropriate ways to address overall project risk and individual project risks

Inputs	Tools & Techniques	Outputs
.1 Project management plan • Resource management plan • Risk management plan • Cost baseline .2 Project documents • Lessons learned register • Project schedule • Project team assignments • Resource calendars • Risk register • Risk report • Stakeholder register .3 Enterprise environmental factors .4 Organizational process assets	.1 Expert judgment .2 Data gathering • Interviews .3 Interpersonal and team skills • Facilitation .4 Strategies for threats .5 Strategies for opportunities .6 Contingent response strategies .7 Strategies for overall project risk .8 Data analysis • Alternatives analysis • Cost-benefit analysis .9 Decision making • Multicriteria decision analysis	.1 Change requests .2 Project management plan updates • Schedule management plan • Cost management plan • Quality management plan • Resource management plan • Procurement management plan • Scope baseline • Schedule baseline • Cost baseline .3 Project documents updates • Assumption log • Cost forecasts • Lessons learned register • Project schedule • Project team assignments • Risk register • Risk report

Appropriate Risk Responses

- The significance of the risk
- Cost-effective in meeting the challenge
- Realistic within the project context
- Agree upon by all parties involved
- Owned by a responsible person

Responses for Negative Risks

- Escalate
- Risk avoid
  - Familiar hw/sw
- Risk mitigate
  - Competent project personnel or backup
- Risk transfer
  - Warranty protection for specific hardware
- Risk accept
  - Specific meeting site

Online hospital

- The selection of Web Server
  - familiar software/hardware
- High-pressure Transaction payment
  - outsource it to somewhere else
- High-pressure Transaction payment
  - restrict the number of access
- One of your developer is going to leave
  - not an important developer

General Risk Mitigation Strategies for Technical, Cost, and Schedule Risks

Technical Risks	Cost Risks	Schedule Risks
Emphasize team support and avoid stand-alone project structure	Increase the frequency of project monitoring	Increase the frequency of project monitoring
Increase project manager authority	Use WBS and CPM	Use WBS and CPM
Improve problem handling and communication	Improve communication, project goals understanding, and team support	Select the most experienced project manager
Increase the frequency of project monitoring	Increase project manager authority	
Use WBS and CPM		

Responses for Positive Risks

- Escalate
- Risk exploit
  - Make it happen
- Risk enhance
  - Identify and maximize key drivers
- Risk share
  - Partner
- Risk accept
  - do nothing

Online hospital

- Exploit
  - We are the first product in the market, the market is big. add more resources to accelerate the development
- Enhance
  - Promote in rural areas
- Share
  - share with retirement organization, western province.

Residual and Secondary Risks

- **Residual risks** are risks that remain after all of the response strategies have been implemented.

- **Secondary risks** are a direct result of implementing a risk response.

Strategies for Overall Project Risk

- Avoid
- Exploit
- Transfer/share
- Mitigate/enhance
- Accept

- Escalate?

- High-risk elements
- High-benefit elements
- Joint venture
- Replan the project
- Overall contingency reserve

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Implement Risk Responses

- The process of implementing agreed-upon risk response plans

- Key benefit: 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 individual project opportunities

Implement Risk Responses

Inputs	Tools & Techniques	Outputs
.1 Project management plan • Risk management plan .2 Project documents • Lessons learned register • Risk register • Risk report .3 Organizational process assets	.1 Expert judgment .2 Interpersonal and team skills • Influencing .3 Project management information system	.1 Change requests .2 Project documents updates • Issue log • Lessons learned register • Project team assignments • Risk register • Risk report

Contents

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Monitor 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.

Key benefit: it enables project decisions to be based on current information about overall project risk exposure and individual project risks.

Inputs	Tools & Techniques	Outputs
.1 Project management plan • Risk management plan .2 Project documents • Issue log • Lessons learned register • Risk register • Risk report .3 Work performance data .4 Work performance reports	.1 Data analysis • Technical performance analysis • Reserve analysis .2 Audits .3 Meetings	.1 Work performance information .2 Change requests .3 Project management plan updates • Any component .4 Project documents updates • Assumption log • Issue log • Lessons learned register • Risk register • Risk report .5 Organizational process assets updates

Tasks

- Implemented risk responses are effective
- Level of overall project risk has changed
- Status of identified individual project risks has changed
- New individual project risks are arisen
- Risk management approach is still appropriate
- Project assumptions are still valid
- Risk management policies and procedures are being followed
- Contingency reserves for cost or schedule require modification
- Project strategy is still valid

Reserve Analysis

Compare the amount of the contingency reserves remaining to the amount of risk remaining at any time in the project in order to determine if the remaining reserve is adequate

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Using Software to Assist in Project Risk Management

- Risk registers can be created in a simple Word or Excel file or as part of a database.
- More sophisticated risk management software, such as Monte Carlo simulation tools, help in analyzing project risks.
- The PMI Risk Specific Interest Group's Web site at *www.risksig.com* has a detailed list of software products to assist in risk management.

Results of Good Project Risk Management

- Unlike **crisis management**, good project risk management often goes unnoticed.
- Well-run projects appear to be almost effortless, but a lot of work goes into running a project well.
- Project managers should strive to make their jobs look easy to reflect the results of well-run projects.

What the ancients called a clever fighter is one who not only wins, but excels in winning with ease.

Hence his victories bring him neither reputation for wisdom nor credit for courage.

He wins his battles by making no mistakes. Making no mistakes is what establishes the certainty of victory, for it means conquering an enemy that is already defeated.

SUN TZU ON THE ART OF WAR

Thanks!

清華大學
Tsinghua University