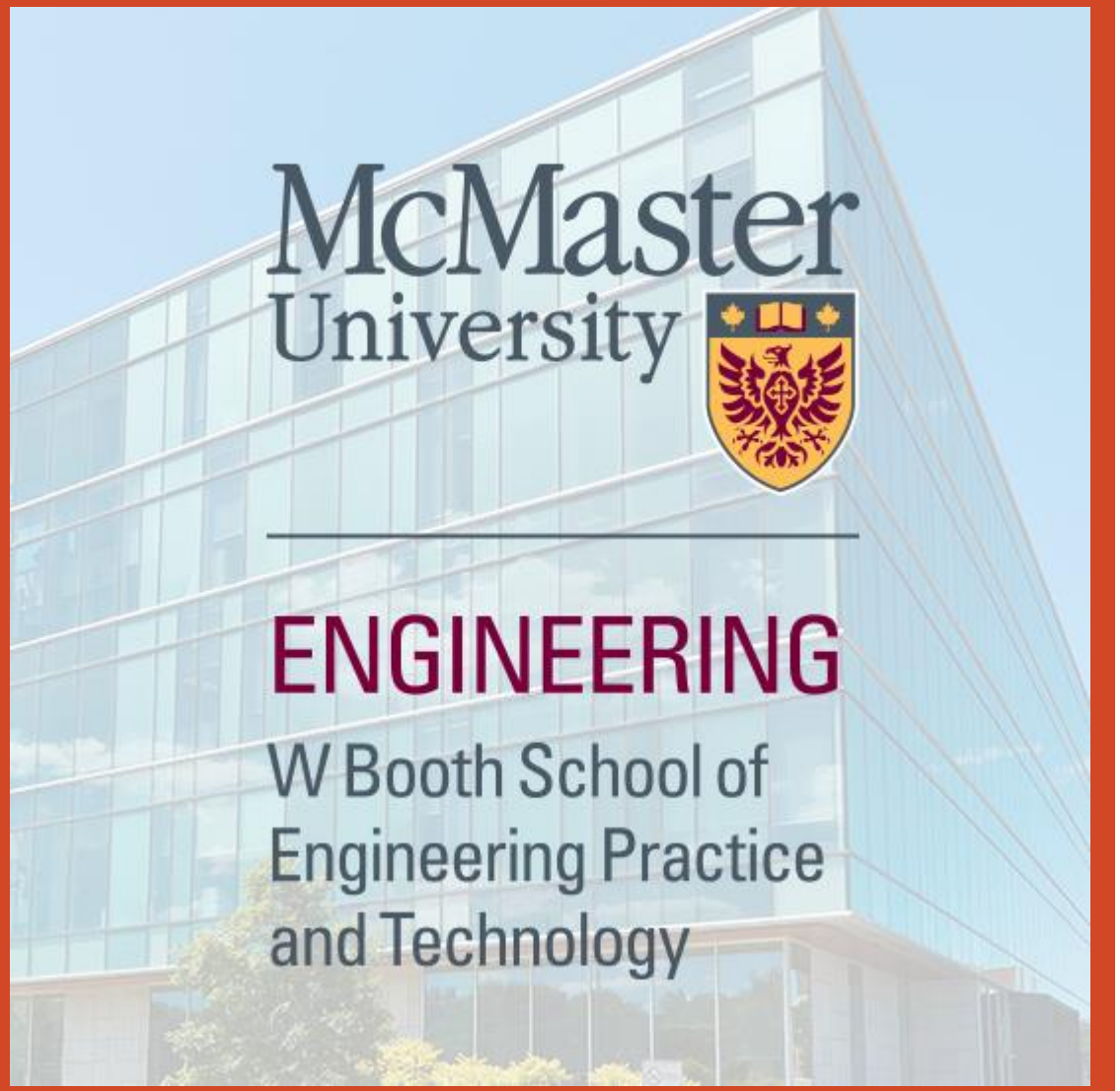
Practical Project Management for Today's Business Environment

Week 4: Risk Management & Contingency



Dr. Mikhail Hanna, PhD, PMP, PMI-RMP

Learning Objectives

- Key points:
  - Understand the role of risk management in projects.
  - Learn how to use a Risk Register to identify and mitigate risks.
  - Apply contingency planning to ensure project success in various industries.

What is Risk Management

Definition: Risk management is the process of identifying, analyzing, and responding to project risks to minimize negative impacts.

Example: Boeing 737 Max Crisis – Failure in risk assessment for the software design led to catastrophic consequences.

Issue Vs Risk

Definition:

- **Risk:** A future event that may impact the project (positive or negative).
- **Issue:** A current problem impacting the project.

Example:

- **Risk:** "We might experience material delays.“
- **Issue:** "We are currently delayed due to late materials."

Construction:

- Delayed concrete delivery (**risk**) vs. ongoing labor strike (**issue**).

Software:

- Potential integration problems (**risk**) vs. current server crash (**issue**).

Categories of Risks

1. **Operational Risk**
   - Risks arising from day-to-day business operations.
   - Examples: Equipment failure, supply chain disruptions, inadequate processes.
2. **Technical Risk**
   - Risks associated with technology and system failures.
   - Examples: Software bugs, cybersecurity threats, or faulty system designs like the MCAS in the Boeing 737 MAX crisis.3.
3. **Financial Risk**
   - Risks that can affect an organization's financial stability.
   - Examples: Market fluctuations, credit risk, currency exchange rates, or liquidity shortages.
4. **Reputational Risk**
   - The risk of damage to an organization's public image or brand value.
   - Examples: Product failures, public scandals, or poor crisis communication.
5. **Regulatory/Compliance Risk**
   - Risks associated with not complying with laws, regulations, or internal policies.
   - Examples: Fines, legal actions, or operational restrictions due to non-compliance with safety standards.
6. **Strategic Risk**
   - Risks that affect the ability to achieve business objectives.
   - Examples: Misaligned business strategies, mergers or acquisitions, poor market positioning.

Categories of Risks

7. Market/Competitive Risk

- Risks due to changes in the market or actions by competitors.
- Examples: Loss of market share, new disruptive technologies, or competitor innovations.

8. Human Resource Risk

- Risks related to employees and workforce management.
- Examples: Talent shortages, employee errors, strikes, or leadership failure.

9. Legal Risk

- The risk of legal actions or disputes.
- Examples: Lawsuits, intellectual property infringement, or contract violations.

10. Environmental Risk

- Risks from environmental factors.
- Examples: Natural disasters, climate change, or pollution liabilities.

11. Project Risk

- Risks specific to managing and completing projects.
- Examples: Delays, cost overruns, resource shortages, or scope changes.

12. Political Risk

- Risks due to political changes or instability.
- Examples: Changes in government policies, trade restrictions, or political unrest.

Categories of Risks

13. Health & Safety Risk

- Risks that affect the health and safety of employees or customers.
- Examples: Workplace accidents, pandemics, or exposure to hazardous materials.

14. Supply Chain Risk

- Risks affecting the flow of goods and services.
- Examples: Supplier failure, transportation disruptions, or raw material shortages.

15. Cybersecurity Risk

- Risks related to data breaches and information system vulnerabilities.
- Examples: Hacking, data theft, or malware attacks.

Risk Register - Tool

Introduction to Risk Register

Definition: A Risk Register is a tool to document risks, their assessment, mitigation strategies, and tracking.

Key columns: Risk ID, Description, Probability, Impact, Mitigation, Owner, Status.

Example: A risk for a software project – "Risk ID: 001, Risk: Server Overload, Probability: High, Impact: Critical, Mitigation: Increase server capacity."

Explanation of each field:

- **Risk** ID: Unique identifier for each risk.
- **Description**: What the risk entails.
- **Probability**: Likelihood of occurrence.
- **Impact**: Effect on the project if it happens.
- **Mitigation**: Action to reduce the risk.
- **Owner**: Who is responsible.
- **Status**: Open/Closed/Under Review.

Template Overview

RISK REGISTER TEMPLATE

Labels	
Very High	5
High	4

PROJECT METHOD	Waterfall
Document Type:	RISK Register

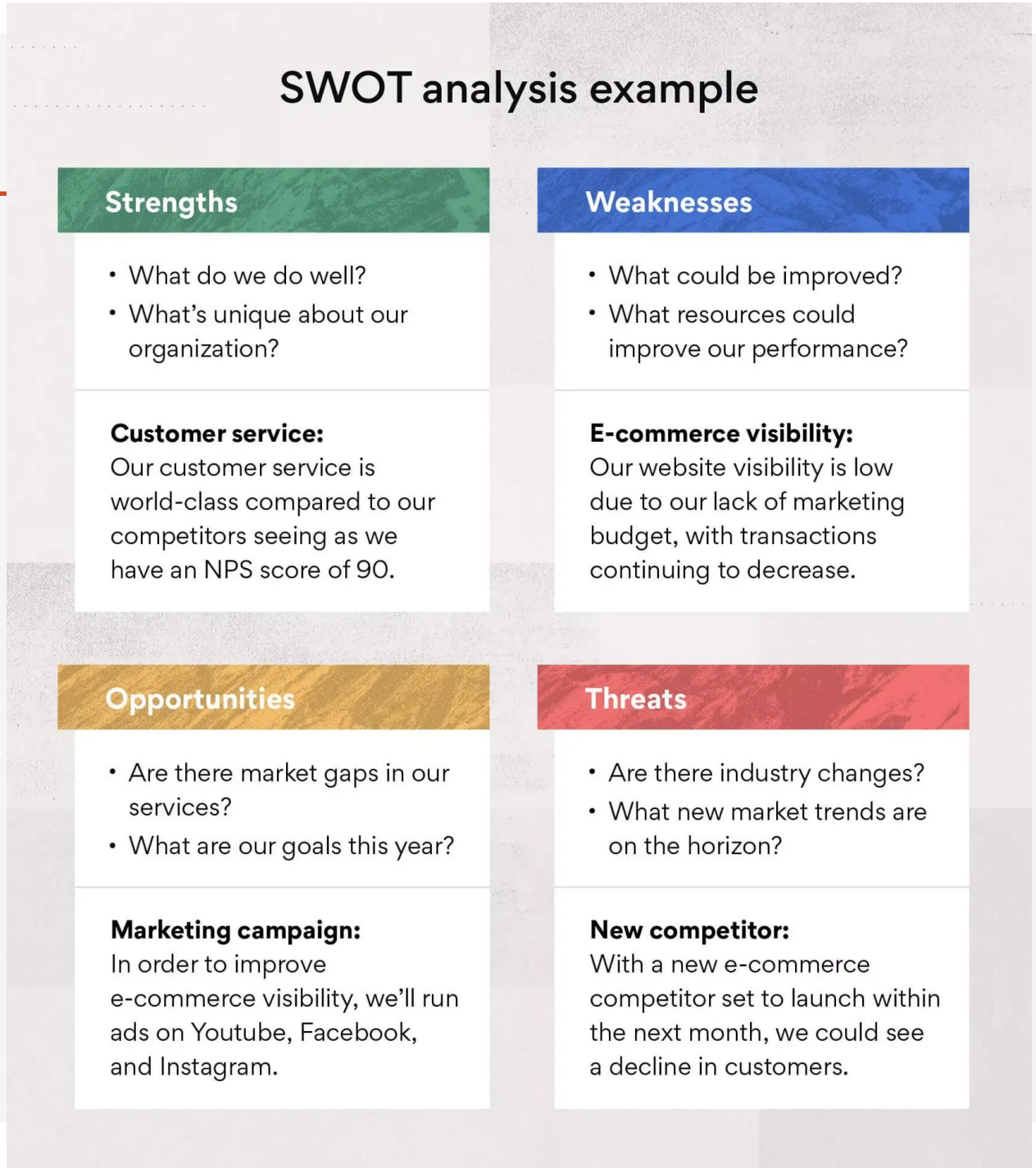
Risk ID	Date Raised	Risk Originator(Raised By)	Risk Description	Risk Category	Probability	Impact	Severity	Risk Response	Trigger	Risk Owner	Action Owner
1	01-01-2023	Sunil Kumar Dash	**Risk:** Integration Challenges: Difficulty in integrating various software components, resulting in delays or functionality issues.	Technical (Network,IT)	4	4	16	Mitigation	Lack of proper communication between development teams.	Michael Jordan	Michael Jordan
2	02-01-2023	Sunil Kumar Dash	**Risk:** Security Vulnerabilities Potential security breaches and data leaks, leading to compromised user information.	Internal	5	5	25	Mitigation	Weaknesses in the application's architecture or inadequate security measures.	Sagar Mehta	Sagar Mehta
3	03-01-2023	Sunil Kumar Dash	**Risk:** Scope Creep Continuous expansion of project scope beyond the initial requirements, leading to delays and resource constraints.	Internal	5	4	20	Mitigation	Frequent changes in client requirements or poor scope management.	Viktor	Viktor
4	04-01-2023	Sagar Kumar	**Risk:** Integration Challenges: Difficulty in integrating various software components, resulting in delays or functionality issues.	Technical (Network,IT)	4	4	16	Mitigation	Lack of proper communication between development teams.	Michael Jordan	Michael Jordan
5	05-01-2023	Sagar Kumar	**Risk:** Security Vulnerabilities Potential security breaches and data leaks, leading to compromised user information.	Internal	5	5	25	Mitigation	Weaknesses in the application's architecture or inadequate security measures.	Sagar Mehta	Sagar Mehta
6	06-01-2023	Sumant Mehta	**Risk:** Scope Creep Continuous expansion of project scope beyond the initial requirements, leading to delays and resource constraints.	Internal	5	4	20	Mitigation	Frequent changes in client requirements or poor scope management.	Viktor	Viktor
			Risk: Integration Challenges:	Technical (Network,IT)	4	4	16	Mitigation	Lack of proper communication between development	Michael Jordan	Michael Jordan

Risk Identification Methodologies

Methods:

- **Brainstorming**: Gather ideas from the team.
- **SWOT analysis**: Identify Strengths, Weaknesses, Opportunities, Threats.
- **Expert judgment**: Involve experienced professionals.

Example: SWOT analysis for a product launch in the automotive industry

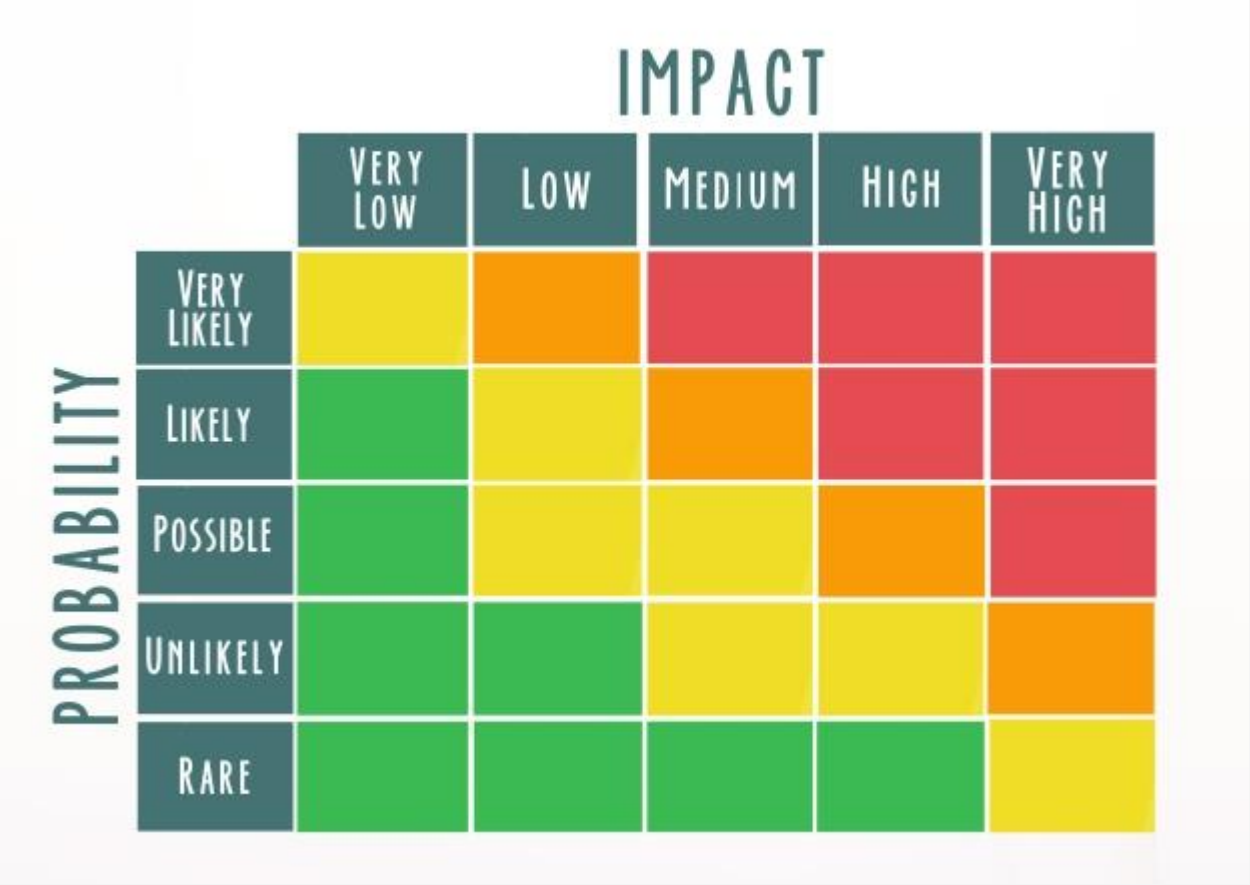


Risk Assessment – Qualitative Analysis

Definition: Assess risks based on probability and impact.

b: The Channel Tunnel Project - Overestimated timelines due to inaccurate risk assessment led to delays and cost overruns.

Visual: A heat map risk matrix (Low/Medium/High) with an example from a real-world project.



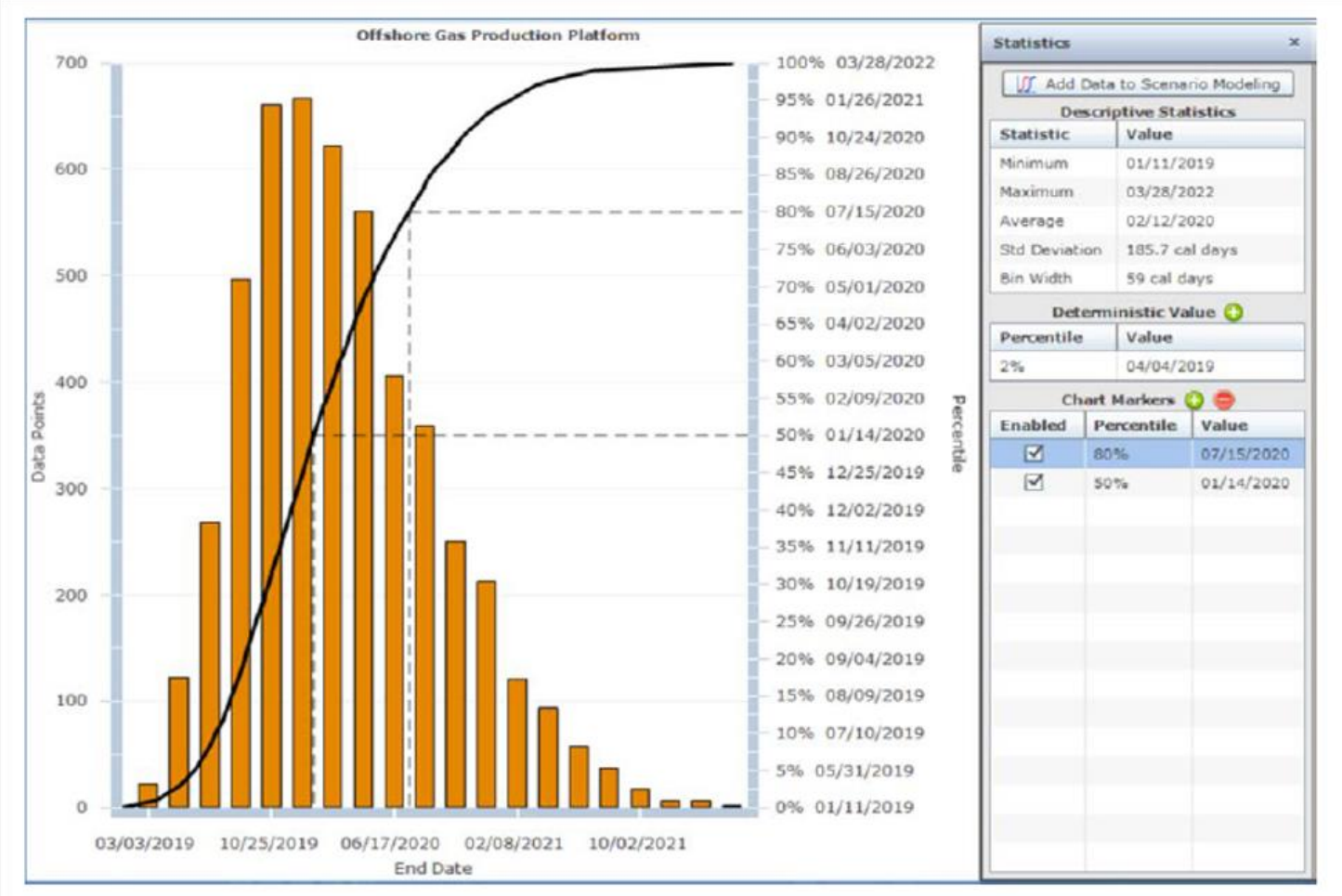
Risk Assessment – Qualitative Analysis

		Consequences				
		Insignificant (1) No injuries / minimal financial loss	**Minor (2)** First aid treatment / medium financial loss	**Moderate (3)** Medical treatment / high financial loss	**Major (4)** Hospitable / large financial loss	**Catastrophic (5)** Death / massive financial loss
Likelihood	**Almost Certain (5)** Often occurs / once a week	Moderate (5)	High (10)	High (15)	Catastrophic (20)	Catastrophic (25)
	Likely (4) Could easily happen / once a month	Moderate (4)	Moderate (8)	High (12)	Catastrophic (16)	Catastrophic (20)
	Possible (3) Could happen or known it to happen / once a year	Low (3)	Moderate (6)	Moderate (9)	High (12)	High (15)
	Unlikely (2) Hasn't happened yet but could / once every 10 years	Low (2)	Moderate (4)	Moderate (6)	Moderate (8)	High (10)
	Rare (1) Conceivable but only on extreme circumstances / once in 100 years	Low (1)	Low (2)	Low (3)	Moderate (4)	Moderate (5)

Risk Assessment – Quantitative Analysis

Definition: Use of data-driven techniques to measure risks in terms of dollars or time impact. It is a statistical method that uses numerical data to calculate the probability and impact of risks in a project or business. It's used to help businesses understand the potential outcomes of different scenarios and make informed decisions

Example: For a new product launch: Quantify the risk of manufacturing delays causing a 3-month revenue loss.



Risk Assessment – Quantitative Analysis

Three Point Estimate: This method utilizes optimistic, most likely, and pessimistic values to derive the most accurate estimate.

Decision Tree Analysis: This graphical representation outlines the consequences of different choices or paths.

Monte Carlo Analysis: A method that applies optimistic, most likely, and pessimistic estimates to forecast total project costs and completion dates. For instance, it can estimate the probability of finishing a project for $20M, or determine the cost required to achieve an 80% probability of meeting cost objectives.

Sensitivity Analysis: This approach identifies which risks have the most significant impact on the project.

Fault Tree Analysis (FMEA): An examination of a structured diagram that pinpoints elements potentially leading to system failure.

Expected Monetary Value (EMV): A technique for calculating contingency reserves for project budgets and schedules.

Risk Assessment Comparison

Qualitative Risk Analysis	Quantitative Risk Analysis
It considers all the risks identified in the identified risk process	It only considers the risk which we mark for further analysis in the Perform Qualitative Risk Analysis Process.
It does not analyze the risk mathematically to identify the probability and likelihood	Perform Quantitative Risk Analysis uses the probability distributions to characterize the risk's probability and impact.
In this, we assess individual risk by assigning a numeric ranking of probability and impact; usually; the rank of 0 to 1 is used where 1 demonstrate high.	It predicts likely project outcomes in terms of money or time based on combined effects of risks.
We apply the Qualitative Risk Analysis process in almost all the projects	We don't use this process in simple and moderately complex projects. We may not find its use in software projects.

Risk Mitigation

Risk Mitigation Strategies

Risk Acceptance

- The acceptance risk mitigation strategy involves identifying whether the risks to a project are acceptable.
- This typically occurs in cases where the impact of the risk or the chances of it occurring are considered low.
- Risk acceptance can also be implemented when the cost of mitigating a risk is higher than the cost of the risk occurring.

Real Life Example

A team working on a new website may identify that developing a new feature will push the project over the original timeline. They may find that risk acceptable if the rewards of the new feature are greater than the cost of delaying project completion.

Risk Mitigation Strategies

Risk Avoidance

- When using the risk avoidance strategy, any actions will usually be taken to avoid a risk from occurring.
- In some cases, these actions can be costly, so this risk mitigation strategy is often chosen when the threat a risk poses is considered high.

Real Life Example

If a team developing a new product identifies a possible issue with its performance, they may implement product testing—and assume any additional costs related to it—to avoid the risk of product failure before the final design is approved. If a safety risk is perceived, they may abandon production altogether.

Risk Mitigation Strategies

Risk Control

- Team members may also implement a control strategy when mitigating risks to a project. This risk mitigation strategy works by taking actions or enacting policies to address the risk.

Real Life Example

A project team can implement control methods to manage potential budget risks by focusing on management and decision-making to identify funding flaws early. If there's a risk of exceeding the budget, they may take measures to control spending, such as cutting costly resources.

Risk Mitigation Strategies

Risk Transfer

- Mitigating the consequences of identified risks by transferring them to another party is also a viable risk mitigation strategy. However, this strategy can present drawbacks and additional costs and should be implemented in a way that all parties can accept.

Real Life Example

When producing a new product that relies on parts from an external supplier, a company may implement risk transfer through the vendor's contract, requiring them to cover the costs associated with any product defects or delays in production caused by their parts or actions.

Risk Mitigation Strategies

Watch and Monitor

- Using this risk mitigation strategy involves watching for and identifying any changes that can affect the impact of a risk.
- Production teams might include this strategy as part of their project review plan. Cost, scheduling and performance are all aspects of a project that can be monitored for new or changing risks.

Real Life Example

A finance team or budget committee can monitor any risks to a project's budget by creating a reporting routine to review each project expenditure. In this example, the team can regularly assess the budget and address any issues accordingly.

Contingency Planning

Definition: Set aside resources (time/money) to handle risks.

Real-life example: SpaceX Falcon 9 - Using contingency funds to handle unexpected technical challenges.

How to calculate: Estimate risk impact and reserve a percentage of the budget.

Example: On a software development project, allocate 15% of budget for handling integration risks.

Activity	Budget Baseline	Budget Reserve	Project Budget
Design	$500	$15	$515
Code	900	80	980
Test	20	2	22
Subtotal	$1,420	$97	$1,517
Management reserve	—	—	50
Total	$1,420	$97	$1,567

Boeing 737 Crisis - Expland

Boeing 737 MAX Crisis Overview

Background:

- The Boeing 737 MAX was launched in 2017 to compete with Airbus A320neo. It was marketed as a fuel-efficient, long-range aircraft.
- Two major crashes occurred within six months: Lion Air Flight 610 in October 2018 and Ethiopian Airlines Flight 302 in March 2019, killing 346 people in total.

Boeing 737 MAX Crisis Overview

What Went Wrong?:

- Both crashes were linked to the Maneuvering Characteristics Augmentation System (MCAS), an automated system designed to prevent stalls by pushing the nose down.
- Faulty sensor readings caused MCAS to activate incorrectly, forcing the aircraft into a dive despite pilot efforts to correct it.

Impact:

- Boeing's stock plunged, the fleet was grounded worldwide, and orders were canceled.
- The FAA and international regulators launched investigations, leading to increased scrutiny of Boeing’s internal processes.

Risk Identification

Technical Risks:

- The MCAS design flaw: The system relied on a single angle-of-attack sensor, making it vulnerable to faulty readings.
- Lack of redundancy and insufficient testing of MCAS in real-world conditions.

Regulatory Risks:

- Self-Certification: Boeing was allowed to certify certain safety aspects under FAA oversight. This reduced external scrutiny.
- Over-reliance on internal assessments and a rush to compete with Airbus.

Reputational Risks:

- The crashes resulted in public distrust of Boeing and the FAA. The once-reliable Boeing brand was now associated with negligence.
- Negative media coverage increased pressure on Boeing and regulators.

Financial Risks:

- Grounding costs, compensation to victims' families, order cancellations (Southwest Airlines and other major clients).
- Additional costs for retraining pilots and redesigning the MCAS system.

Risk Assessment

Risk Probability and Impact Matrix:

- High Probability, High Impact: The failure of MCAS in critical flight situations led to crashes with catastrophic loss of life and financial damage.
- Misjudging the likelihood of failure due to overconfidence in the system's design and insufficient pilot training.

Severity:

- The potential consequences (loss of lives and financial disaster) were enormous, yet Boeing underestimated the likelihood of failure by neglecting proper testing and validation of the system.

Regulatory Gaps:

- Lack of oversight from the FAA and Boeing's decision to avoid extensive pilot training on MCAS (in order to save costs) contributed to the severity of the risks.

Missed Warning Signs:

- Lion Air crash provided critical information that was not acted upon in time to prevent the Ethiopian Airlines crash.

Risk Response and Mitigation

Initial Response:

- After the Lion Air crash, Boeing focused on software updates without acknowledging the need for comprehensive retraining.
- Failure to ground the fleet immediately post-crash demonstrated delayed risk response.

Delay in Communication:

- Boeing was slow to inform the public and airlines about the extent of the MCAS issue.
- Delayed acknowledgment of the software's critical flaw resulted in further damage to the company's reputation.

Proactive Measures:

- Post-crash: Boeing updated the MCAS software to include inputs from multiple sensors and gave pilots more control to override the system.
- Recertification efforts took longer than expected, extending the grounding period and costing Boeing billions.

Crisis Communication:

- Poor communication in the early stages led to a public relations disaster. Boeing struggled to balance transparency with legal and financial concerns.

Role of Corporate Culture in Risk Management

Internal Pressures:

There was immense pressure to compete with Airbus and launch the 737 MAX as quickly as possible.

Organizational decisions prioritized timelines over rigorous safety protocols, with insufficient testing and minimal pilot training.

Corporate Culture & Risk Tolerance:

Boeing’s risk culture was skewed towards profitability, resulting in systemic oversights in safety. The emphasis on short-term gains outweighed the long-term implications of a potential crisis.

Moral Hazard:

The financial incentives to rush production and overlook risks meant that safety concerns were pushed aside. This led to Boeing's lack of investment in thorough risk mitigation strategies like comprehensive pilot training.

Risk Monitor and Control Post Crisis

Stronger Regulations:

The FAA and global regulatory bodies imposed more stringent safety standards on Boeing, with independent reviews required for critical systems.

Internal Reforms:

Boeing restructured its safety oversight practices, creating a dedicated safety department that reported directly to the board.

More robust testing protocols were introduced, and a stronger focus on risk governance became central to future aircraft development.

Software and Pilot Training Improvements:

The MCAS system was redesigned to receive input from multiple sensors, and pilots were mandated to undergo comprehensive simulator training.

These changes are now incorporated into standard risk controls to prevent similar failures

Lessons Learned

Risk Governance:

Effective governance includes better collaboration between regulatory bodies and manufacturers to ensure thorough and unbiased risk assessments.

Communication During Crises:

Timely and transparent communication is essential. Boeing’s reluctance to provide full disclosure led to additional scrutiny and loss of public trust.

Ethics and Safety Prioritization:

Safety must always be prioritized over cost-saving measures or competitive pressures. Organizations should adopt a long-term view that prioritizes ethical responsibility.

Adopting a Holistic Risk Approach:

Risk management should encompass more than just technical risks. Financial, regulatory, and reputational risks need to be equally considered and monitored in real time.

Conclusion

Recap of Key Takeaways:

The Boeing 737 MAX crisis highlights the critical importance of a well-rounded risk management strategy, one that prioritizes safety, transparency, and ethical decision-making.

Future Applications:

These lessons can be applied across industries. Whether it's aviation, technology, or finance, robust risk management frameworks are necessary to avoid preventable disasters.

Final Thought: In the fast-paced business world, can ethical leadership and comprehensive risk management coexist, or will competitive pressures always undermine them?

Group Exercise

Group Exercise: Comprehensive Risk Management Activity

Scenario:

You are part of a project management team responsible for overseeing the construction of a **new hospital wing**. Your task is to collaboratively complete the risk management process for one key risk that may arise during this project.

Select a Project Risk (5 minutes)

Based on your knowledge of the project, choose one risk that could potentially impact the construction timeline, budget, or resources.

Risk Assessment (10 minutes)

Using a **Risk Matrix** (provided as a handout or projected on the screen), place your risk based on its **likelihood** (Low, Medium, High) and **impact** (Low, Medium, High).

Mitigation Strategy (5 minutes)

Discuss and document **one mitigation strategy** that could reduce the likelihood or impact of the risk.

Contingency Plan (5 minutes)

Allocate a **contingency budget** or time reserve to handle the risk if it occurs.

Take Aways

Risk Management Process

- Identify potential risks early in the project.
- Assess the likelihood and impact of each risk.
- Develop mitigation strategies to reduce risk probability or impact.
- Create contingency plans to address risks if they materialize.

Risk Register

- A critical tool for tracking risks, their assessments, and mitigation strategies throughout the project lifecycle
- Includes fields like risk description, probability, impact, owner, mitigation plan, and contingency plan.

Take Aways

Real-World Application

- Construction Industry: Weather delays affecting project timelines.
- IT/Software: Technology failures or scope creep in software development.
- Healthcare: Regulatory or supplier delays in building new facilities.

Contingency Planning

- Budget and time reserves should be set aside to handle risks.
- Avoid over-allocating resources to low-impact risks while ensuring high-impact risks are adequately planned for.

Reference

Harold Kerzner - Project Management: A Systems Approach to Planning, Scheduling, and Controlling

PMBOK Guide (Project Management Body of Knowledge)

Risk Management for Project Managers (Udemy Course)

Construction Industry Institute - Best Practices in Risk Management

Managing Risk in Software Development Projects (IEEE Xplore)

The Art of Risk Management in IT Projects