

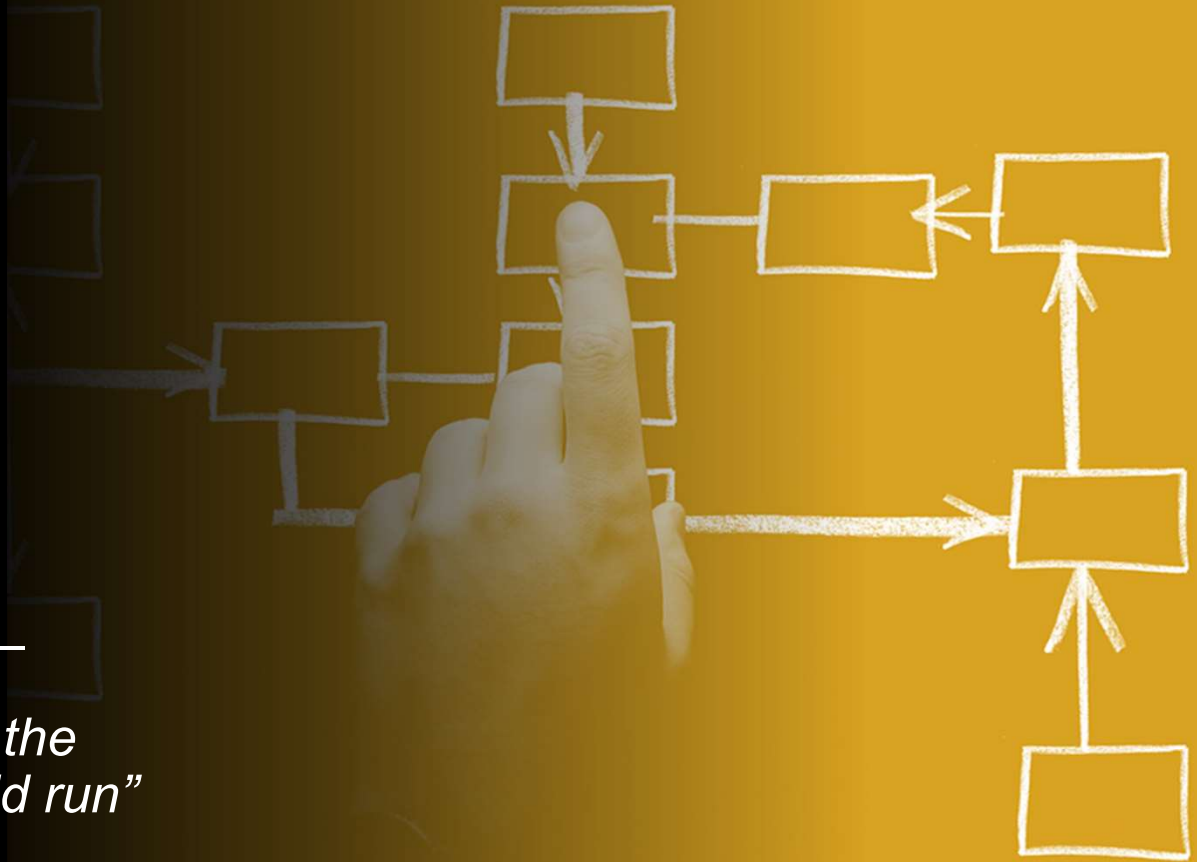


Operations Management MLI21C617

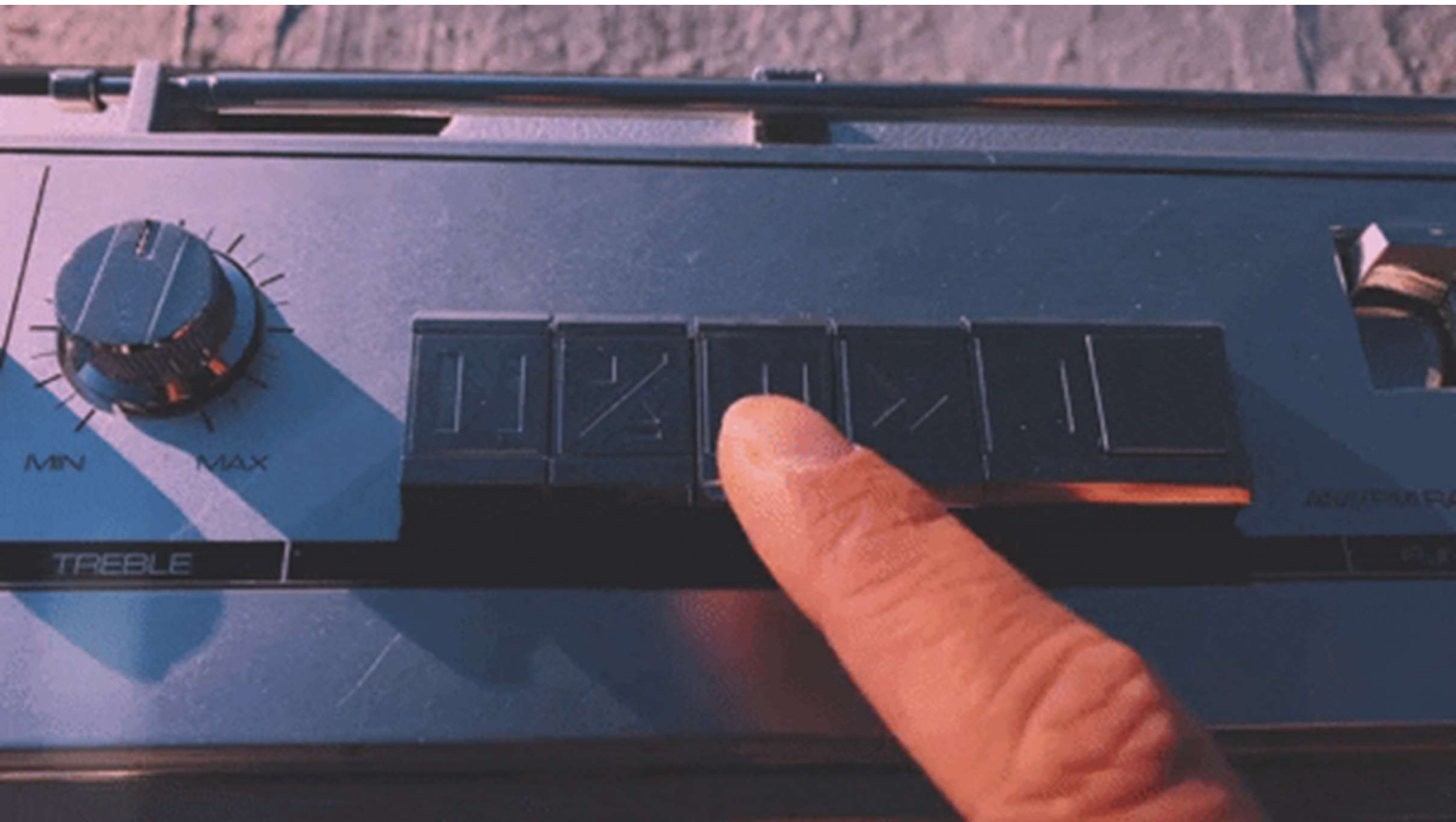
*“Operations may not run the
world, but it makes the world run”*

Lecturer: Misa Bakajic

Spring 2024



Password: Victoria



Recap

1. Randomness exists from internal and external operations
2. We cannot eliminate randomness from our operations
3. We can try and mitigate the risk of unwanted events
 - Understand complexity of the system
 - Increase transparency of operations
 - Separate signal from noise
 - Identify and prepare for risk

A!

LECTURE 9 Supply chain risk and resilience

A!



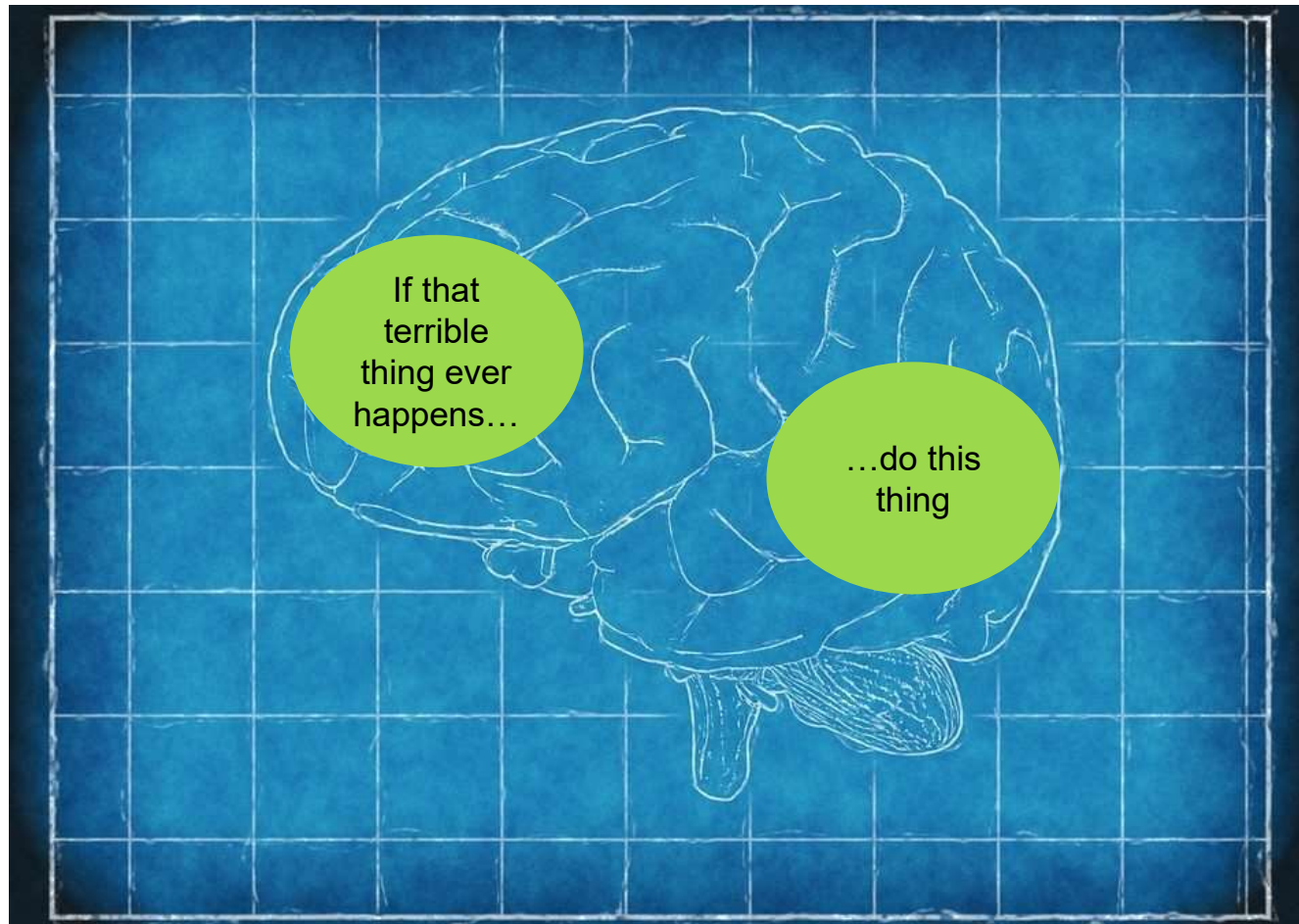
Why do people watch horror movies?

A!

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Nature of uncertainty

Mental blueprint



A!

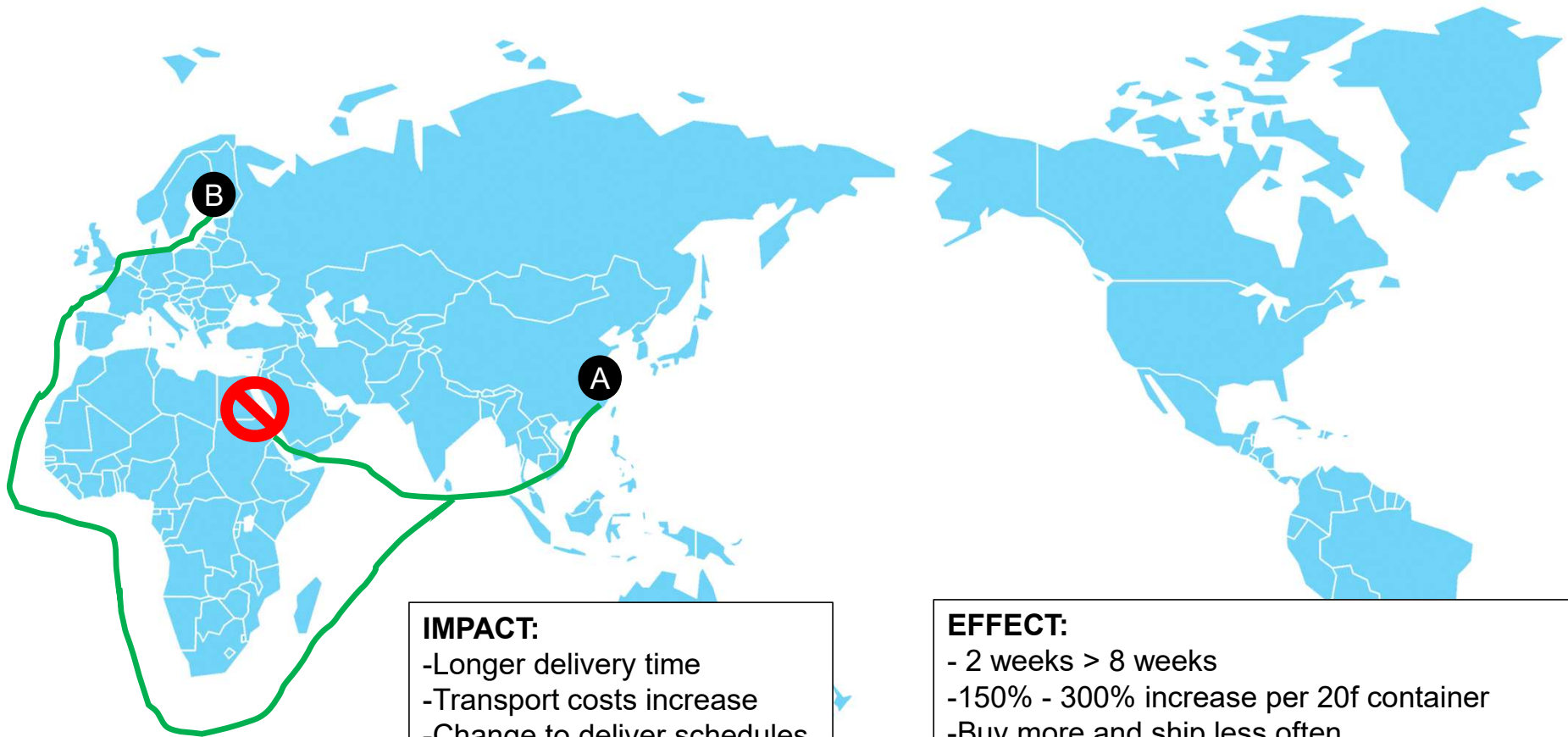
2021 Suez Canal obstruction



- Ever Given is one of the largest container ships in the world.
- In March 2021 it got stuck in the Suez Canal
- Impacted nearly \$10 billion of trade in a day

Vivian Yee, V and Glanz, J (2021). How One of the World's Biggest Ships Jammed the Suez Canal. The New York Times. Found at: <https://www.nytimes.com/2021/07/17/world/middleeast/suez-canal-stuck-ship-ever-given.html>

Impact analysis 2021 Suez Canal obstruction



A!

IMPACT:

- Longer delivery time
- Transport costs increase
- Change to deliver schedules
- Change to buying behaviour

EFFECT:

- 2 weeks > 8 weeks
- 150% - 300% increase per 20f container
- Buy more and ship less often
- May need additional storage capacity

Proactive VS Reactive

Reactive view assumes that:

- “if it aint broke don’t fix it”
- operational problems could arise
- supply issues are momentary
- optimal operational state is goal
- learning/training is done as needed



Proactive view assumes that:

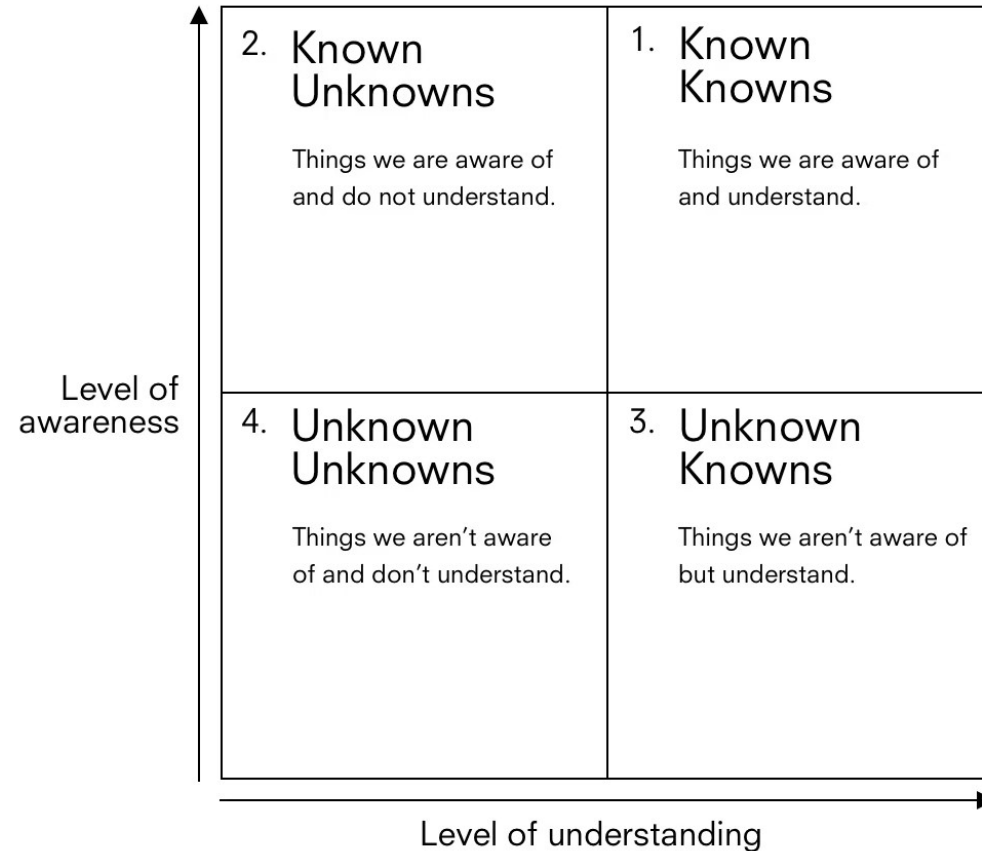
- operational problems will arise
- supply problems will arise
- process improvement never stops
- organizational learning never stops



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Quadrants Of Knowledge

- Popularized by US Secretary of Defense Donald Rumsfeld
- Classifies ability to predict future events depending on our capacity to know
- Based on the “Johari Window”



A!

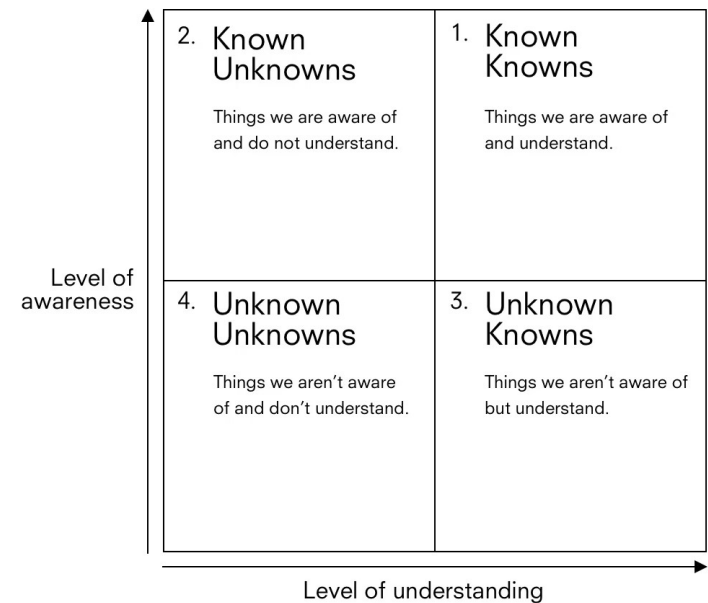
Class exercise – risk categorization

Work in groups to categorize events into one of the 4 quadrants. For this exercise you will assess the risk from the point of view of the Fiskars company decision makers.

Event

- A. Price of metal rises 30% in next year
- B. Labour dispute (strike) in all Fiskars factories at once
- C. New type of AI scissors hit the market
- D. Your new video clip become a viral hit on Tick-Tock
- E. New supply chain disruption due to ongoing global conflict

Time 10 minutes



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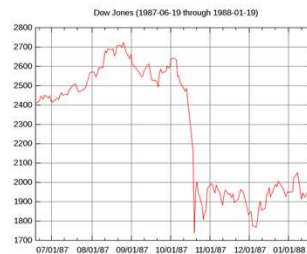
Black swan event



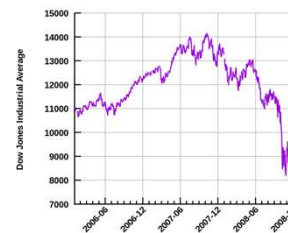
- Popularized by Nassim Nicholas Taleb
 - Unpredictable events
 - Extreme impact on economy
 - Explainable only in hindsight (“looking back everyone has 20-20 vision”)
- “The problem with experts is that they do not know what they do not know”



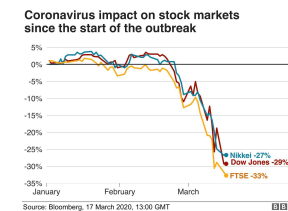
1988



2008



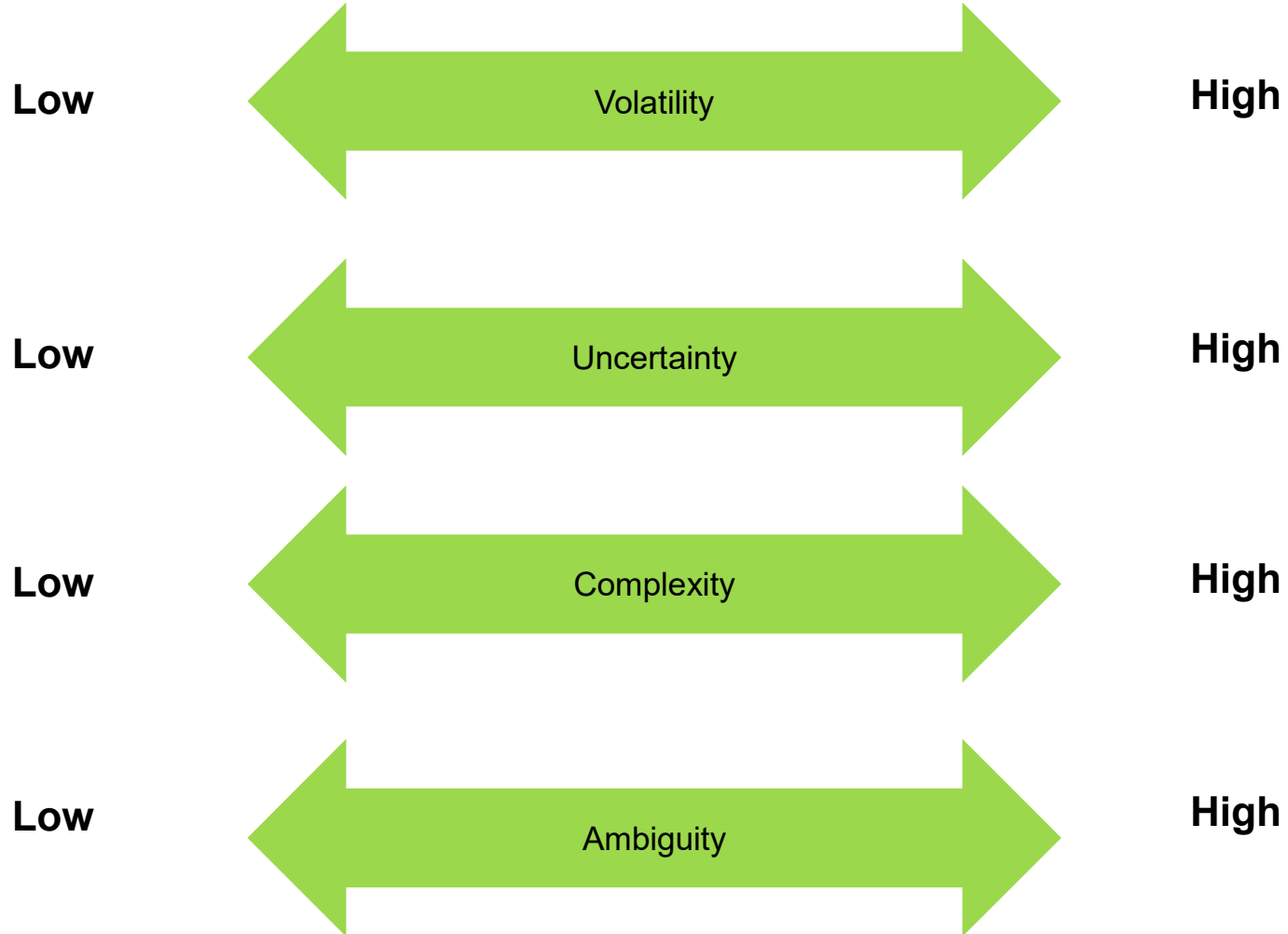
2020



A!

Taleb, N. N. 2007. Black swan. The Black Swan: The Impact of the Highly Improbable. Random House Trade

VUCA Framework



**20TH
CENTURY**

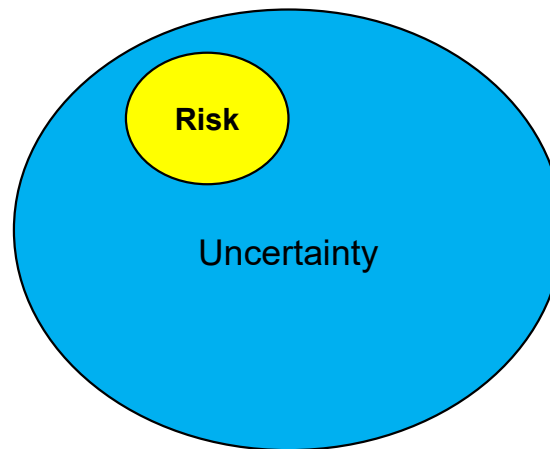
**21TH
CENTURY**

A!

Risk VS Uncertainty

“You can’t manage what you can’t measure” P. Drucker

1. **risk** is present when future events occur with measurable probability
2. **uncertainty** occurs when likelihood of future events is indefinite or incalculable



A!

Knight, H. F. (1921). Risk, uncertainty and profit. Houghton Mifflin. Boston

The Good Judgment Project



- Spin-off from a 2011 project created by Intelligence Advanced Research Projects Activity (IARPA)
- Crowdsourced future event prediction
- Score-based system to reward to analyst
- Events range from commercial events to geo-political occurrences
- Top forecasters allegedly 30% better than intelligence officers with access to actual classified information

A!

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Business uncertainty

Business Uncertainty

- Uncertainty refers to situations under which either the outcomes and/or their probabilities of occurrences are unknown to the decisionmaker.



Business Risk

- The exposure a firm has to factor(s) impacting its profits.

INTERNAL FACTORS

1. Human-factor Risk (e.g. personnel risk, strikes, etc.)
2. Technological Risk (e.g. outdated systems, infrastructure, etc.)
3. Physical Risk (e.g. loss or damage to assets)

EXTERNAL FACTORS

1. Economic Risk (e.g. market change, competition, etc.)
2. Natural Risk (e.g. natural disasters, pandemics, etc.)
3. Political Risk (e.g. Changes in political environment, new laws, tariffs etc.)



Risk VS Response

- Trade-off between the cost of preparing for risks and the probability of the risk occurring.
- Firm must evaluate internal and external events and assess impact to profitability.
- Approach assumes understanding will be incomplete
- Contingency planning is developed to speed up decision-making during crisis.



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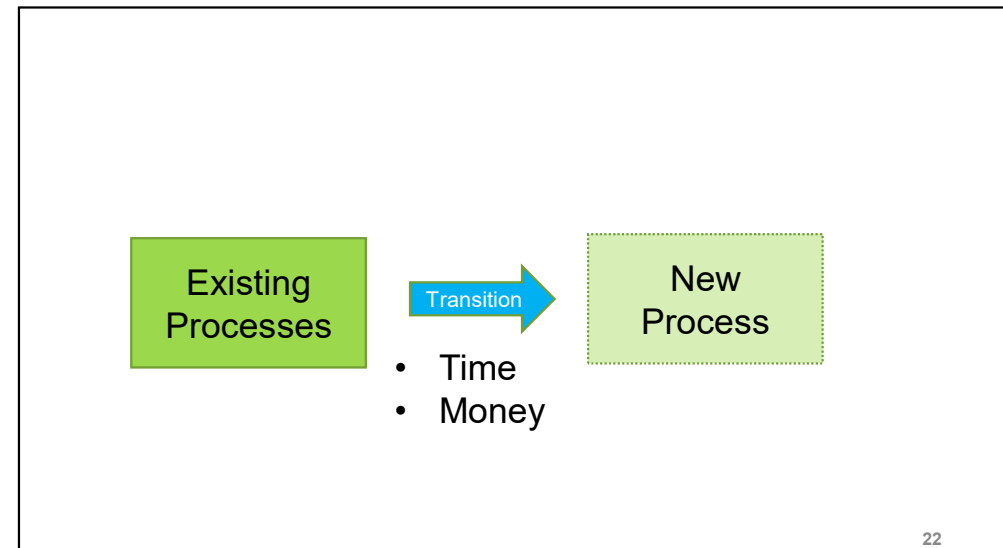
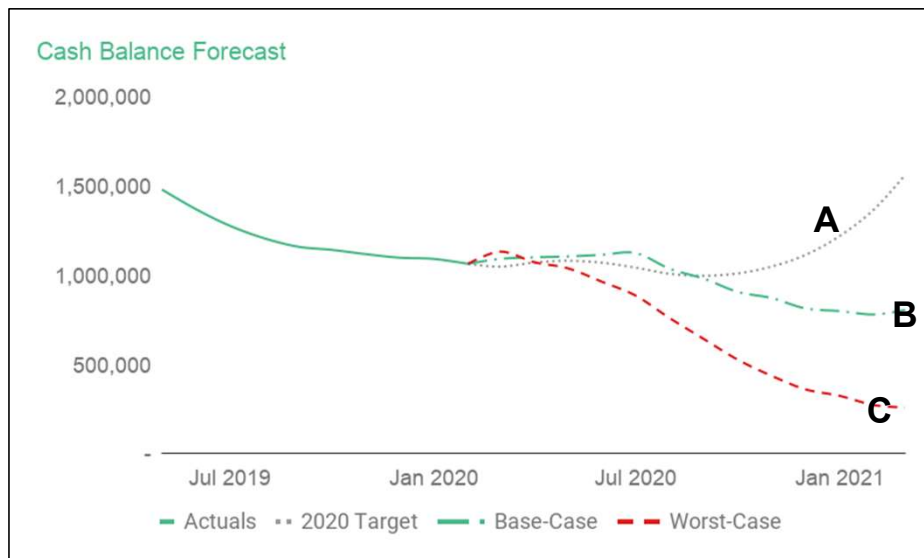
Contingency VS Scenario Planning

Scenario Planning

Future oriented methodology
Considers plausible futures
Estimates risks

Contingency Plan

Type of scenario plan
“Plan B” (insurance policy)
Establishes actions



Risk and resilience assessment

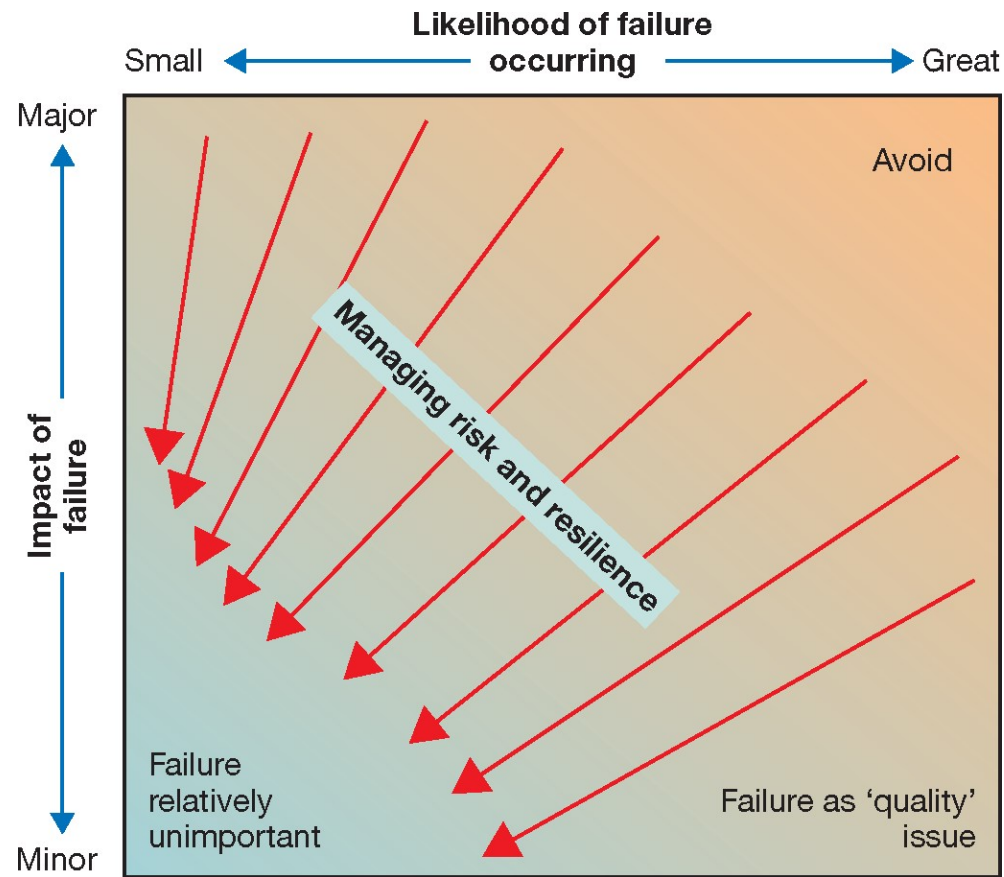


Figure 18.2

A!

Monetary value impact assessment (Risk exposure formula)

Risk is a function of probability of an event (a particular hazard occurring) and the consequences given the event occurs.

1. Assign a probability of occurrence for the risk.
2. Assign monetary value of the impact of the risk when it occurs.
3. Multiply the values produced by step 1 and step 2.
4. Add values to the project cost to calculate total EMV.

$$\text{Estimated Monetary Value} = \text{Probability} \times \text{Impact}$$

A!

Worked example

You work for a large chocolate producer based in Finland. Your team has been tasked with quantifying the monetary impact of two future events:

- A. Based on latest data the global coco prices will rise 30% by the end of the year.
- B. The Government will introduce a new sugar tax on all sweets sold in the country. Which will have a large impact on the profits of the company?

1. Assign a probability of occurrence for the risk.
2. Assign monetary value of the impact of the risk when it occurs.
3. Multiply the values produced by step 1 and step 2.
4. Add values to the project cost to calculate total EMV.

A = 0.70 probability
B = 0.90 probability



A = €1.5 million per year
B = €1.2 million per year

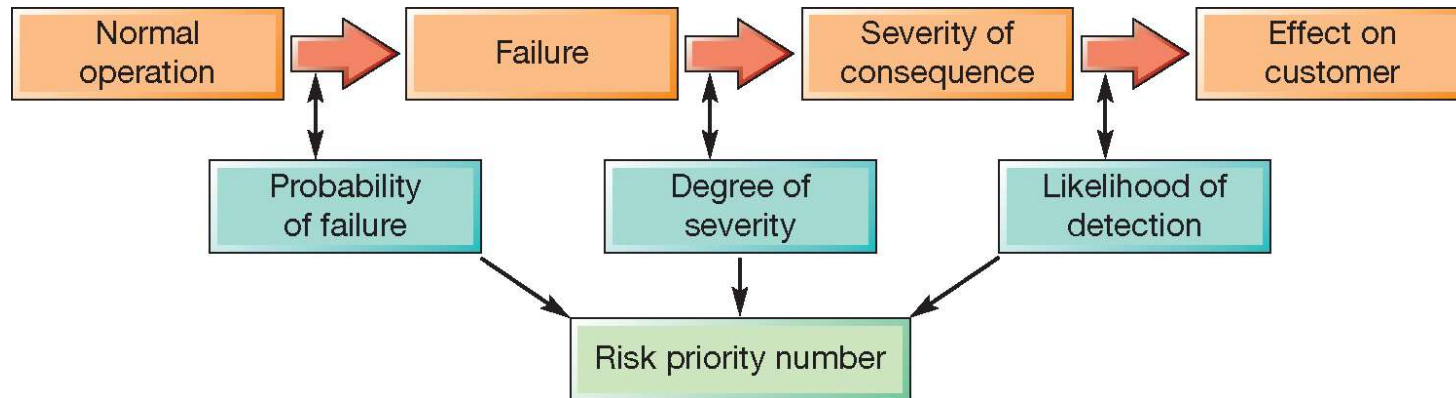


A = 1 050 000
B = 1 080 000

Estimated Monetary Value = Probability x Impact

A!

Procedure for failure modes effects analysis (FMEA)



A!

Figure 18.7

Supply chain risk and resilience

Group Assignment: Supply Chain Cyberattacks

Time: 5 minutes

Assignment:

Search the web for a cyber attack which occurred in the past 10 years and impacted the supply network of any product or service.

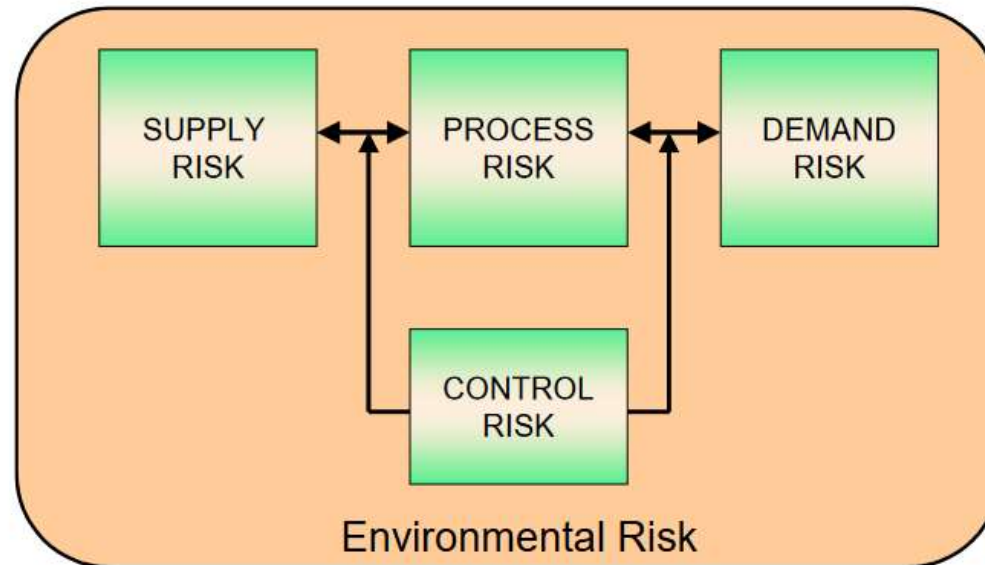
- Explain where it occurred?
- What infrastructure or assets were affected?
- What was the estimated costs?
- How was it mitigated?

Supply chain risk and resilience

- Outsourcing globally has increased *interdependence*, *complexity* and *risk*
- Understanding linkages is extremely difficult > lead to false sense of security
- Creating a risk management culture is crucial to risk strategy
- Mitigating risk depends on:
 - Supply Chain *flexibility*
 - Supply Chain *agility*
 - Supply Chain *SC resilience*

Supply chain risk

Figure 1 : Sources of Risk in the Supply Chain



A!

Christopher, M. and Peck, H., 2004. Building the resilient supply chain. *International Journal of Logistics Management*, Vol. 15, No. 2, pp1-13, 2004
Gautam, B. *Lecture 3: Risk and Uncertainty in Supply Chains*, lecture notes, Coordination of Supply Chains 35E00400, Aalto University, delivered 27 April 2021.

Supply chain risk

Figure 3 : Supply Chain Knowledge



A!

Christopher, M. and Peck, H., 2004. Building the resilient supply chain. International Journal of Logistics Management, Vol. 15, No. 2, pp1-13, 2004

Kraljic Matrix

- Originally used to map purchases based on risk
- Now used to categorize suppliers based on risk
- Developed by Peter Kraljic (1983) HBR
- Reveals connection between Profit VS Risk
- High profit items are critical to profit margin
- Low supply risk allows easy switching

RESPONSE STRATEGIES

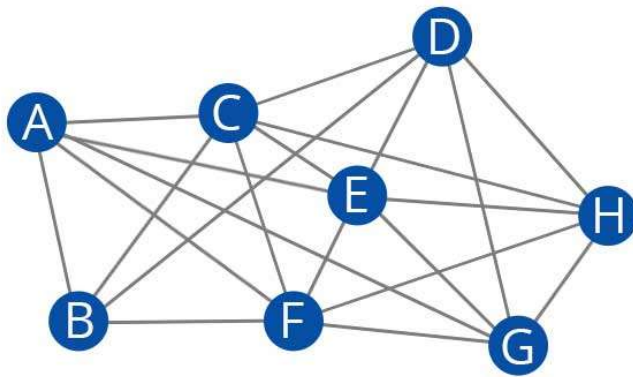
- LEVERAGE – Maximize competition amongst suppliers
- STRATEGIC – Build partnerships with suppliers
- NON-CRITICAL – Reduce transaction costs
- BOTTLENECK – Ensure reliable supply



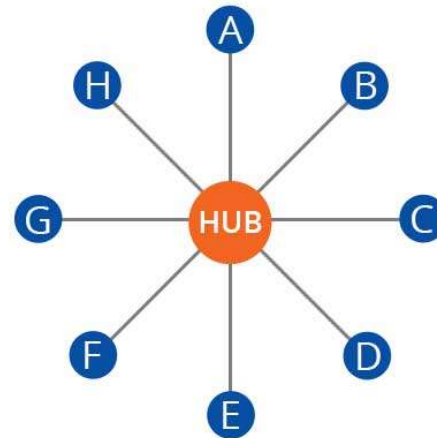
A!

System fragility

Point-to-Point



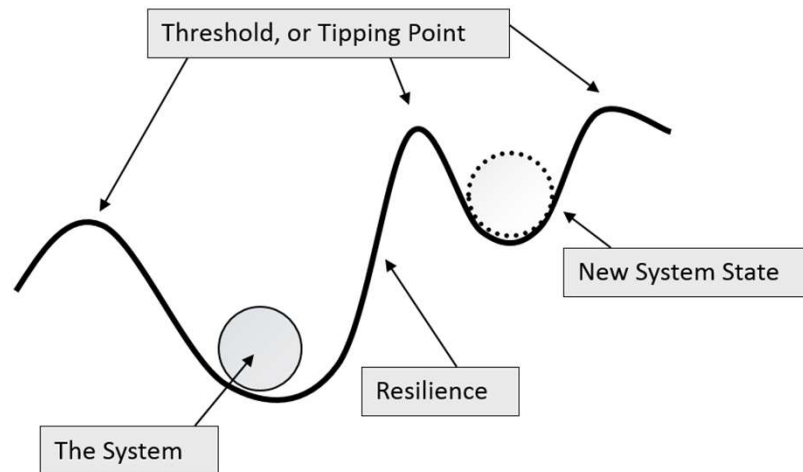
Hub and Spoke



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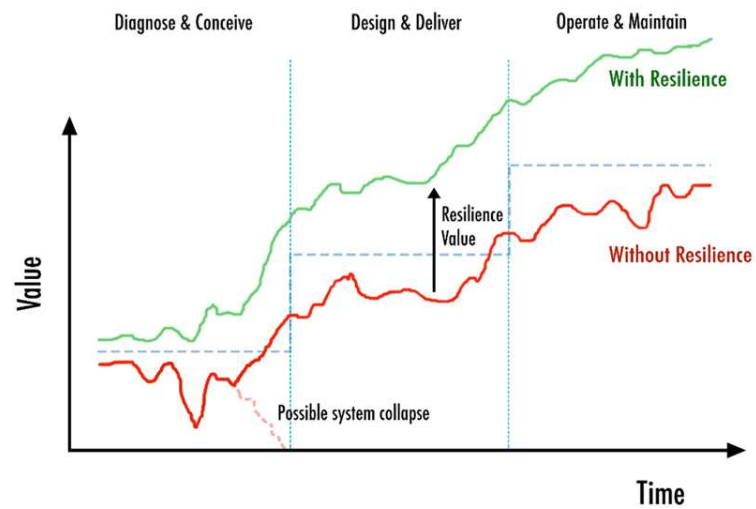
Value chain resilience

- Resilience is the ability of a system to return to its original state



Resilience Matrix

- Do not confuse risk and resilience
- Danger is applying risk based solutions to a problems that requires resilience (*or vice versa*)



A!

Linkov, I. and Trump, B.D., 2019. *The science and practice of resilience*. Cham: Springer International Publishing.

Product and service risk and uncertainty

The sources of potential failure in operations

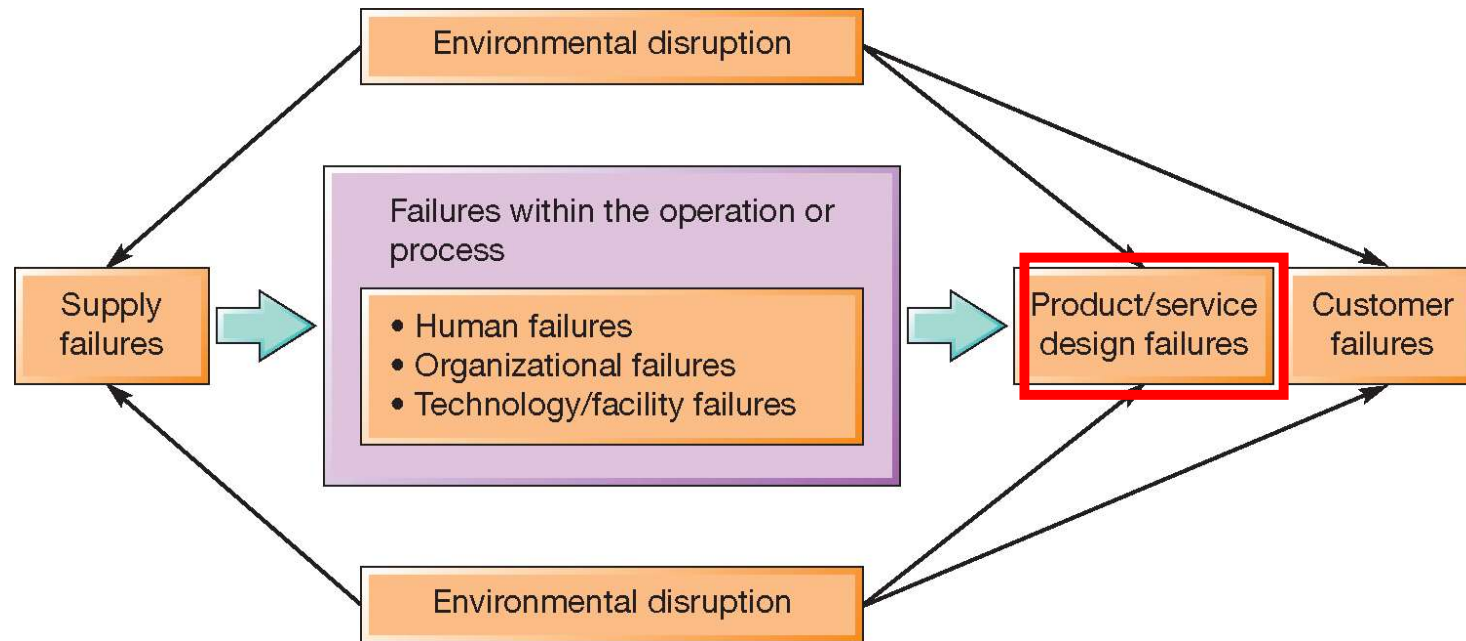


Figure 18.4

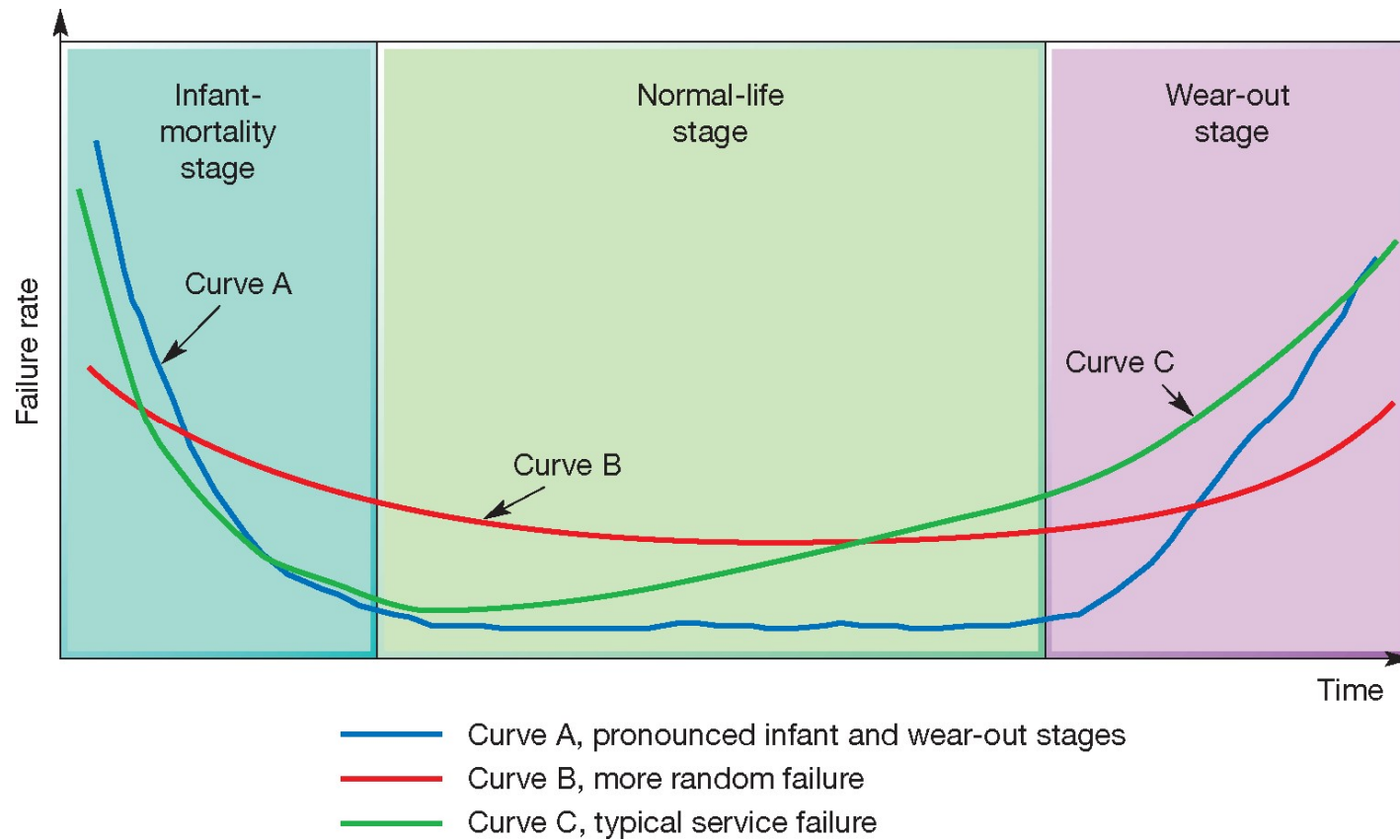
A!

Potential risk identification

- Supply failure
- Organizational failure
- Technology/facilities failures
- Cybersecurity
- Product/service design failures
- Environmental disruption

A!

Analyzing failure as a function of time



A!

Figure 18.6

Maintenance strategies

The three basic approaches to maintenances:

Run-to-breakdown maintenance (RTB)

Run facility/assets until failure

IMPACT OF FAILURE LOW

Preventative maintenance (PM)

Servicing ahead of time according to a schedule

IMPACT OF FAILURE HIGH

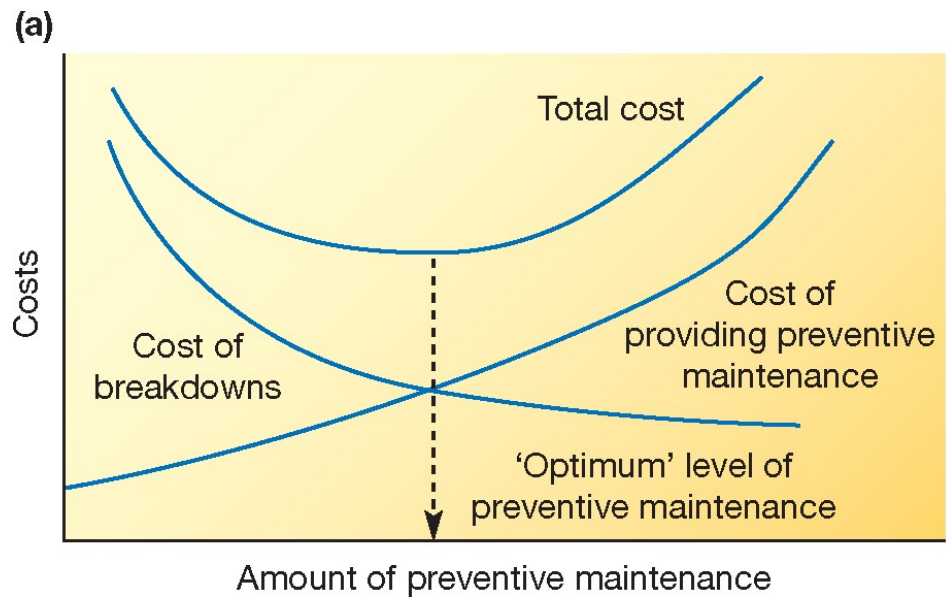
Condition-based maintenance (CBM)

Monitoring and servicing only when required

CONTINUOUS EVALUATION

A!

Two views of maintenance costs



A!

Figure 18.8

A!

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**Kiitos
aalto.fi**