

Advanced supply chain risk management

Capstone: Future-proofing supply chains



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Risk is...

Probability



Impact

Four key concepts in supply chain risk management

Supply Risk

- “...as the probability of an incident associated with inbound supply from individual supplier failures or the supply market occurring, in which its outcomes result in the inability of the purchasing firm to meet customer demand or cause threats to customer life and safety.” (Zsidisin, 2003)

Supply Chain Vulnerability

- “...an exposure to serious disturbance, arising from risks within the supply chain as well as risks external to the supply chain” (Svensson, 2000)


Supply Chain Disruption


- “...unplanned and unanticipated events that disrupt the normal flow of goods and materials within a supply chain” (Craighead et al, 2007)

Supply Chain Resilience


- “...the ability of a system to return to its original state or move to a new desirable state after being moved” (Christopher & Peck, 2004)

What did supply chain risk management research say about preparing for a pandemic?

 Identify – e.g. supply chain mapping

 Assess – Probability and impact

 Mitigate –accept, transfer, share...

 Monitor – data analytics

e.g. Zsidisin *et al.*, 2005; Manuj and Mentzer, 2008a; Tummala and Schoenherr, 2011; Fan & Stevenson 2018

Risk category: Catastrophic	It arises from high impact—low probability potential events associated with man-made deliberate acts (e.g. terrorism), unintentional man-made acts or natural hazards (e.g. hurricanes, earthquakes, tsunamis)	Terrorism, war, nuclear accidents, earthquakes, hurricanes, tsunamis, floods
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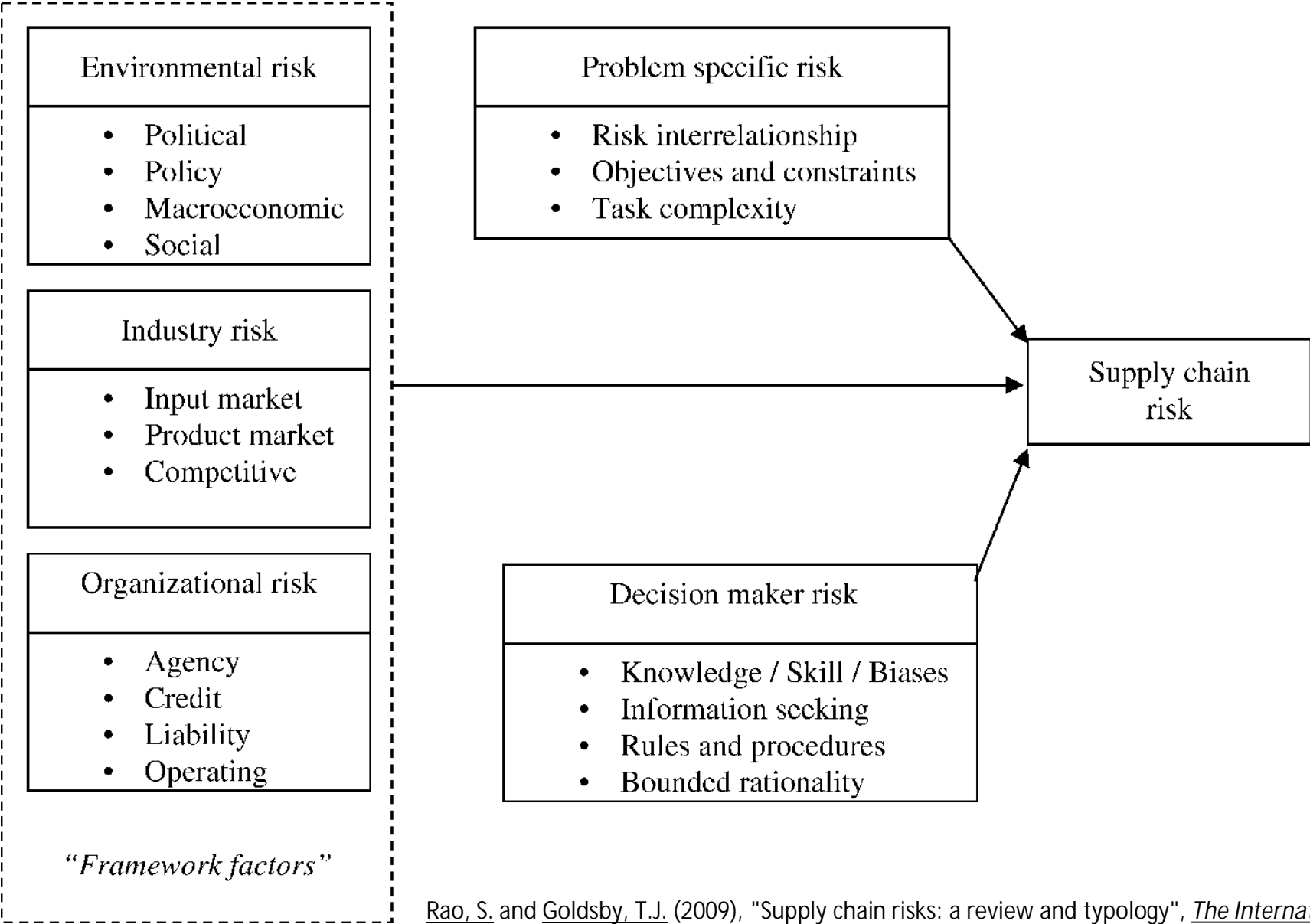
Louis M., Pagell M. (2019) Categorizing Supply Chain Risks: Review, Integrated Typology and Future Research. In: Zsidisin G., Henke M. (eds) Revisiting Supply Chain Risk

NOTHING!

“Normal” disruptions vs. covid in supply chains

	“Normal” supply chain disruption	Covid crisis
Geography	Local / regional	Global
Industry	Single industry	(nearly) all industries
Scope	Supply OR demand OR logistics	Supply AND demand AND logistics
Impact	Short-medium	Medium-long

Lähde: Craighead et al. 2020; Moritz, 2020/ Supply chain management review, Ivanov 2020



Rao, S. and Goldsby, T.J. (2009), "Supply chain risks: a review and typology", *The International Journal of Logistics Management*, Vol. 20 No. 1, pp. 97-123.

Availability of Supply	Quality	Financial
Supply market capacity/allocation Lengthening global supply chains Supply chain transparency Logistics constraints	Quality - impact on costs Quality - impact on customers Counterfeit parts Recalls	Supplier solvency & financial health Inflation/deflation Currency risk Price volatility
Legal and Regulatory	Data Protection and Security	Intellectual Property
Tariffs Customs and trade compliance New regulations Restricted trade Human rights compliance	Cybersecurity Information security Data breach Data privacy Loss, corruption, or misuse of data	Piracy M&A activity Joint ventures Patent & copyright infringement
Brand and Reputational	Disasters	Supplier Characteristics
Litigation Negative news Customer safety Unethical sourcing practices	Natural disasters - floods, hurricanes, tsunamis Accidents - explosions, fires Pandemics	Single/sole sourcing Global suppliers Suppliers in emerging markets Multi-tier supply base
Value Chain Security	Sustainability and EH&S	Political/Government
Tampering Theft Counterfeiting	Environmental impacts Sustainability considerations Safety and workplace conditions	Political stability Government interference Disruptions to government Union disputes

CAPS
Research
2021

Knowns and unknowns

Known unknowns: quantifiable uncertainties that we are aware of and for which a specified probability of occurrence exists

- In SCM e.g., yield, supplier delivery lead times, border crossing times, bad weather, and labor strikes

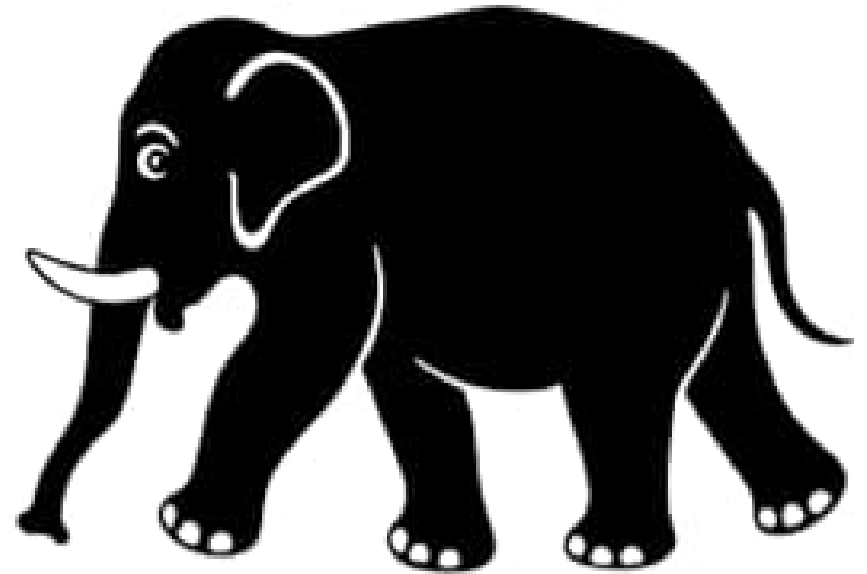
Unknown unknowns: a state or event a decision-maker could not have imagined

- The “black swans”
- Some can be knowable unknowns – e.g. covid did not come as a surprise to epidemiologists

**How can a supply
chain manager
prepare for
unknown
unknowns?**



Which should you actually worry about?

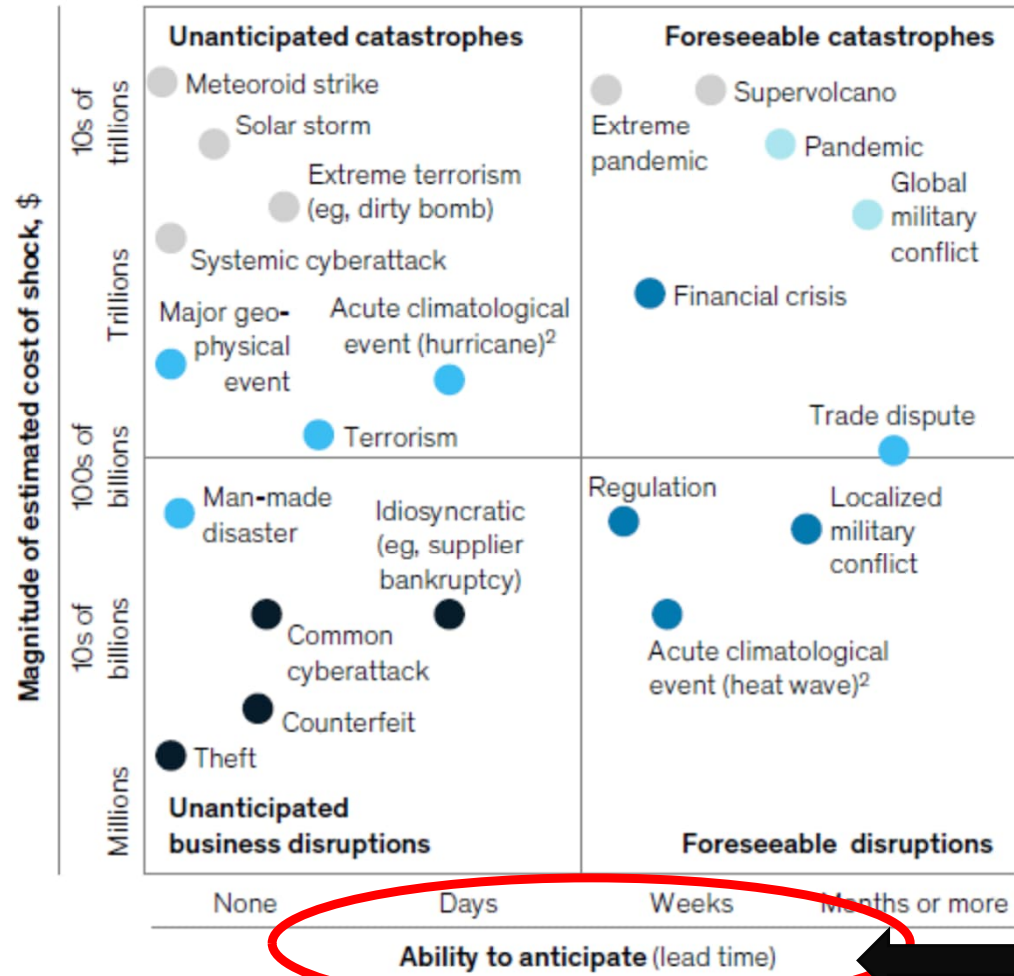


Disruptions vary based on their severity, frequency, and lead time—and they occur with regularity.

McKinsey Global Institute 2022

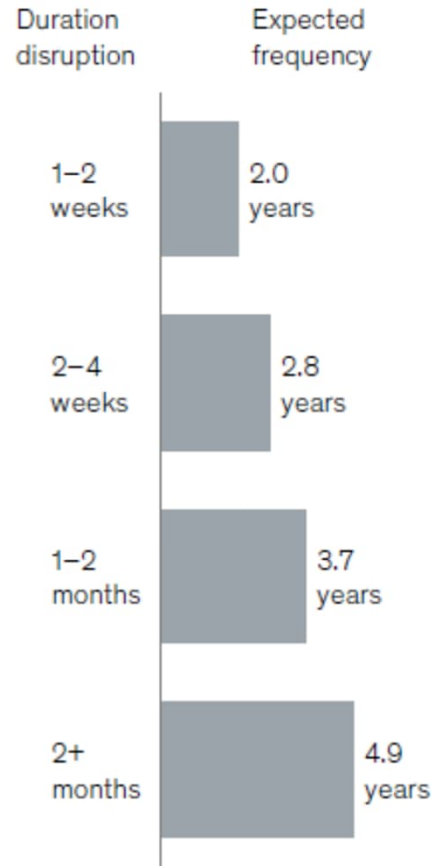
Magnitude and ability to anticipate

Historical frequency More frequent ●●●● Less frequent ● Has not (yet) occurred at scale¹

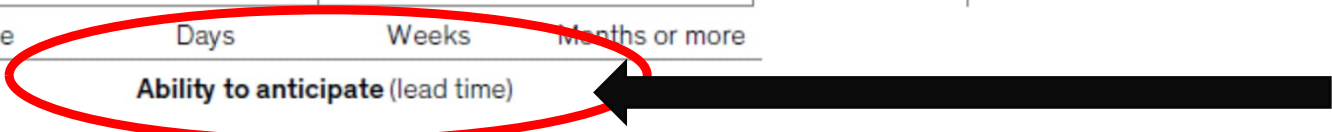


Expected frequency of a disruption, by duration, years

Based on expert interviews, n = 35

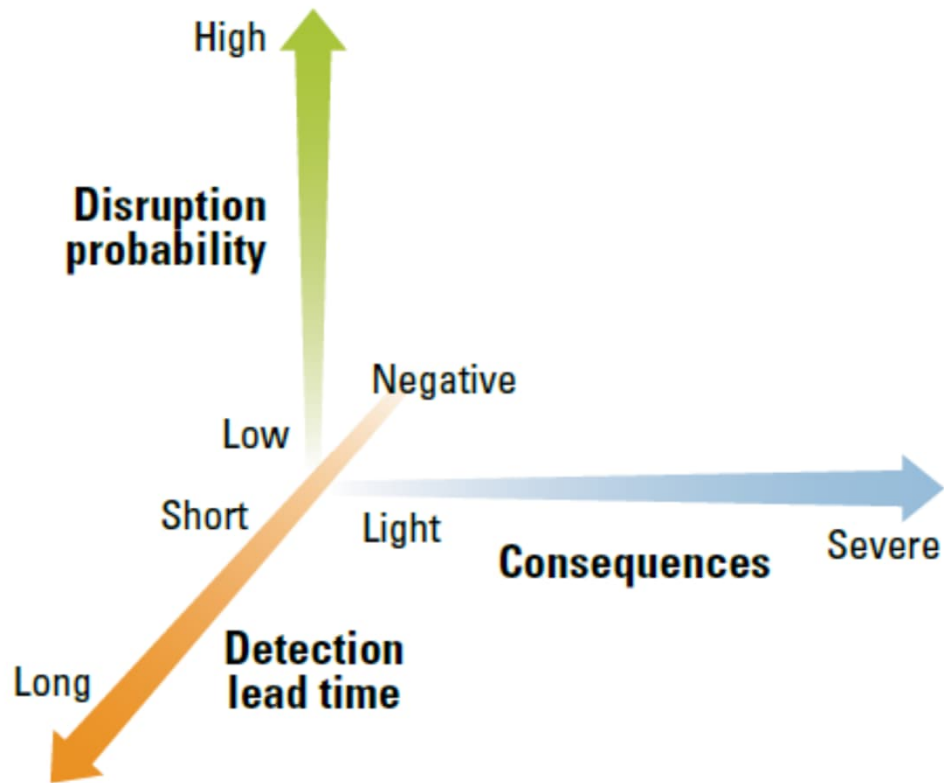


Here is where the difference is made!



THE THIRD DIMENSION OF DISRUPTIONS: DETECTION LEAD TIME

The detection lead time for an event can be positive (if the event is detected or forecast in advance of its impact on the company), zero (if it is detected at the moment it hits the company), or negative (if disruption is not detected until after the event occurs).



**MAPPING
HELPS TO
IMPROVE
THIS!!**

Assessing Impact? Use a Simple Questionnaire

The first step in assessing the risk associated with a particular supplier is to calculate time to recovery (TTR) for each of its sites under various disruption scenarios. Companies can develop a simple survey to collect key data, including:

1 SUPPLIER

- Site location (city, region, country)

2 PARTS FROM THIS SITE

- Part number and description
- Part cost
- Annual volume for this part
- Inventory information (days of supply) for this part
- Total spend (per year) from this site

3 END PRODUCT

- OEM's end product(s) that uses this part
- Profit margin for the end product(s)

4 LEAD TIMES FROM SUPPLIER SITE TO OEM SITES

- Days

5 TIME TO RECOVERY (TTR)

The time it would take for the site to be restored to full functionality

- if the supplier site is down, but the tooling is not damaged
- if the tooling is lost

6 COST OF LOSS

- Is expediting components from other locations possible? If so, what is the cost?
- Can additional resources (overtime, more shifts, alternate capacity) be organized to satisfy demand? If so, what is the cost?

7 SUPPLIER RISK ASSESSMENT

- Does the supplier produce only from a single source?
- Could alternate vendors supply the part?
- Is the supplier financially stable?
- Is there variability in performance (lead time, fill rate, quality)?

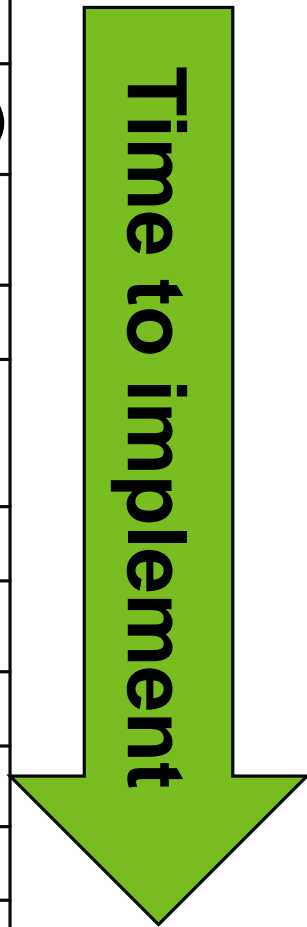
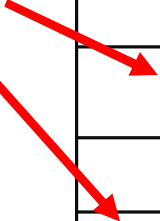
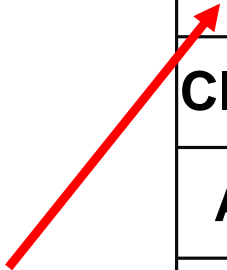
8 MITIGATION STRATEGIES FOR THIS SUPPLIER-PART COMBINATION

- Alternate suppliers
- Excess inventory
- Other

PROACTIVE MITIGATION OPTIONS

Inventory/safety stock management
Forward buying or hedging to mitigate cost risks
Closer collaboration and planning with suppliers (Tiers 1&2)
Active supplier monitoring combined with early detection
Alternate or dual sourcing
Contract management, including risk sharing and performance-based contracts
Designing products for resiliency
Designing supply networks for greater resiliency
Rationalizing product portfolios
Regionalizing production and distribution
Near-shoring
Vertical integration

Cross-functional work needed



Source: Resilinc

Managing financial risk in supply chains

Strategic requirements for supplier insurance and limitations of liability

- Every contract should address: limitation of liability, indemnification, and supplier insurance

Provider optimization and redundancy

- Avoid excessive consolidation of the supplier base
- A balanced supplier portfolio:
 - Multiple plants by the provider
 - Multiple suppliers in a primary and secondary role

Visibility to supplier financial stability

AGILE DESIGN INNOVATION



- Component substitution
- Material substitution
- Multiple variations that are non-visual
- Shift in usage process

ADAPTABLE GLOBAL SOURCING



- Real-time global sourcing map
- Substitution sourcing plan
- Inventory planning and positioning
- Shift baseline from total cost management to total out of stock management

Supply chain resilience playbook

MODAL MANUFACTURING



- Finish-to-order thinking
- Global contingency planning
- Disaster recovery sites/arrangements
- Inventory management for reserve stock

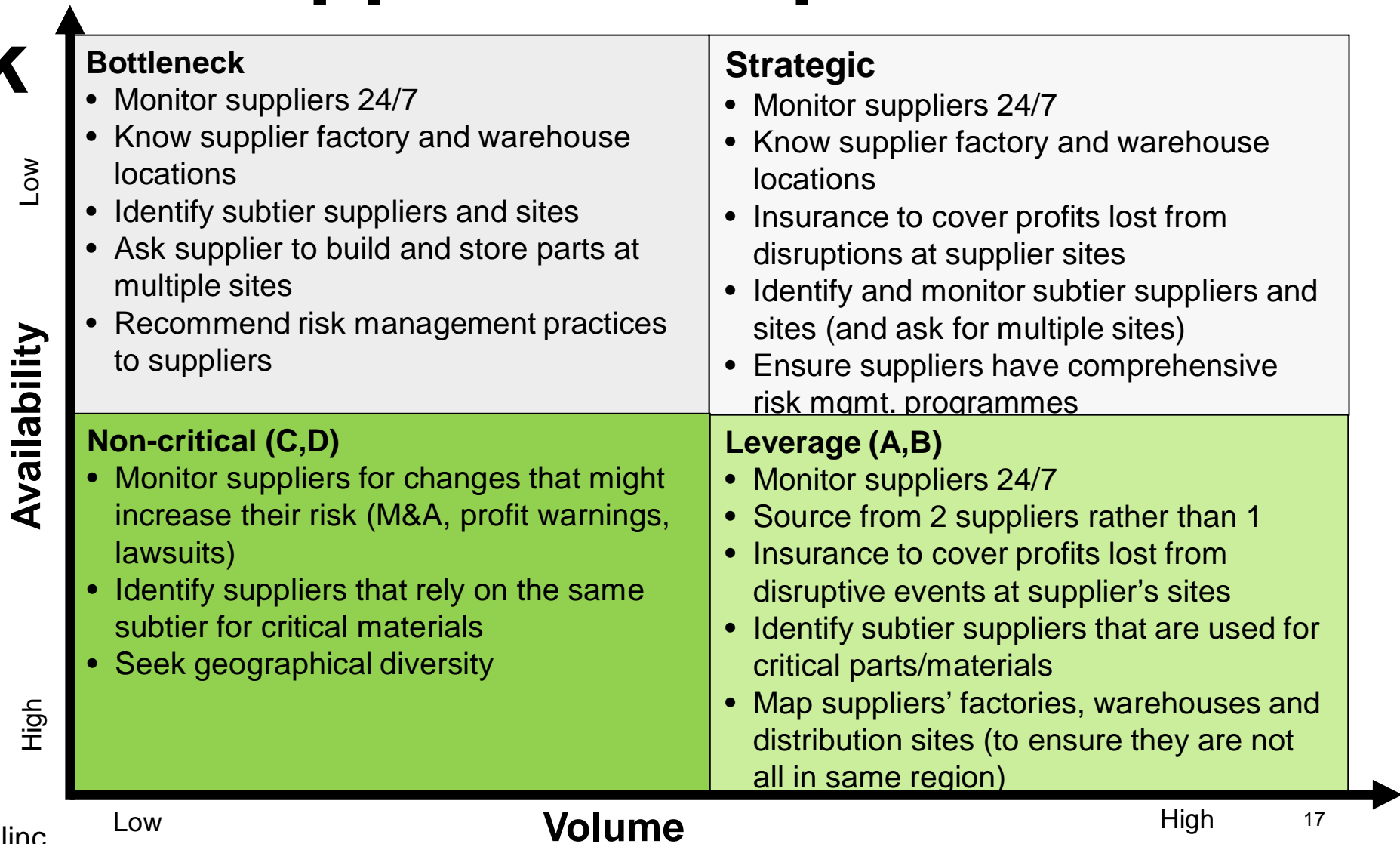
FLEXIBLE ORDER TO DELIVERY



- Real-time key route alternatives
- Within country multi-modal planning
- Disaster recovery site
- Tiered inventory management that shows balance sheet measurements that are unique

Network design
Sourcing strategy
Planning and inventory management
Product and engineering flexibility

Portfolio approach to procurement risk



Learn to manage complexity & uncertainty

Analytics: internal and external

- Increased spend visibility through systems and analytics
- Market intelligence, supplier health checks, weather & political monitoring
- Understand, forecast, make decisions

Impact assessment & Risk management

- Increase detection lead time
- Add buffers & flexibility

Be prepared to reroute, have supplier capacity in different regions

Develop strong relationships with key suppliers

Climate change risks

Physical

- Extreme weather events: storms, floods, hurricanes, cyclones, heatwaves
- Chronic changes in climate: temperature, precipitation and wind speed change, seasonal weather unpredictability

Transition

- Regulations: material restrictions, carbon tax, fuel and energy tax or restrictions, reporting requirements
- Demand and stakeholders: stakeholder pressure, management attention, consumers' environmental awareness

Implications to supply chain operations

- Decreased quality and availability of natural resources and raw materials
- Destructed assets, products, and production sites
- Limited use or increased price of certain materials, fuels, and energy sources
- Damaged infrastructure and power stoppages
- Employee efficiency, health, and safety, labor supply
- Disruptions in water availability affecting raw material sourcing and production
- Unreliability, costs, and delays in transportation systems
- Challenges in inventory planning due to uncertain demand and supply, specifically with outerwear due to unseasonal weather
- Costs of investments in reporting, data management, technologies, risk management
- Changes in the quality, price, and demand for finished goods
- Failure to deliver products on time

Supply chain risk management measures

MSc thesis Pispá, 2022

Risk identification and categorization

- **Identification**
 - General risk maps (e.g., by the World Bank)
 - Scenarios
 - Cause and effect analysis
- **Categorization**
 - Transition (regulation, reputation) and physical (acute, chronic) risks
 - Own, upstream, and downstream operations
 - Logistics risks as one group, other risks by product line

Risk assessment

- Likelihood and impact: low, medium, high
- Country-level assessment
- Short-term risks assessed in detail and quantified
- Long-term assessments based on alternative climate scenarios
- TCFD as support for physical, UNFCCC for transition risks
- Forecasting models for well-known risks
- Scenario and sensitivity analyses for uncertain risks

Risk adaptation

- **General risk adaptation**
 - Flexibility (e.g., substitutive products and components, network structure of supply chain)
 - Investments in infrastructure, technologies and data management software
 - Long-term key supplier relationships
 - Continuous supplier evaluation
 - Risk awareness, flow of information
 - Transparency of operations
 - Buffer time for orders and production schedules
 - Alternative transportation modes or routes

Climate change risk-specific

- Backup suppliers, decentralization of supply, supply close to home operations
- Relocation of supply from a high-risk area
- Backup inventory
- Drainage systems and plans for floodwater handling
- Energy efficiency improvements
- Alternative raw materials and energy sources

Supplier risk management maturity

Trowbridge 2022



FOUNDATIONAL

- Supplier risk not managed
- Policies do not exist
- Siloed, ad-hoc processes
- No formal or dedicated team structure
- Supply managers react to risks and crises as they arise
- Supplier dependency and impacts not assessed



STRUCTURAL

- Effective approaches and processes developed but inconsistently applied
- Policies exist with limited governance
- Commodities and categories selectively prioritized
- Risk factors identified
- Standard assessment questions developed
- Tier 1 suppliers segmented, and dependency mapped
- Emergence of dedicated roles and risk talent strategy
- Descriptive analytics



ACTIONABLE INTELLIGENCE

- Functioning, proactive supplier risk program
- Formal assessment and risk tier methodology standardized
- Inherent and residual risks assessed, but appetite unknown
- Sub-tier supplier dependency minimized
- Program not integrated with expertise risk management
- Increased investment and executive support developing strategic risk management talent
- Predictive analytics, decision trees, total cost



EMERGING INFLUENCE

- Formal program executed globally; includes risk validation, audits, and governance
- Business continuity strategy alignment
- Executive level risk committee reviews risks, mitigation plans
- Risk reviews during new business/product development
- Tier 1 suppliers actively monitored; sub-tier suppliers mapped
- Robust risk talent development and training
- Scenario planning and prescriptive analytics to quantify effect of future decisions



STRATEGIC INTEGRATION

- Holistic management of suppliers and third parties at an enterprise level
- Active risk monitoring and management of sub-tiers
- Risk decision-making owned by business
- Execution level governance review
- Supply chain resiliency strategies developed
- Risk identification, mitigation, at front-end of new business/product development
- Increased risk appetite; manage risk-reward tradeoffs to achieve goals, competitive advantage
- Analytics automation using machine learning to run experiments and adjust actions

Reminder: Project proposal due Monday

This is to communicate your analysis plan for the case company: what do you plan to do and how

700-1000 words (not including references and figures and/or tables)

Outline the following

- Your analysis plan, including but not limited to
 - Assumptions you plan to make in your analyses
 - Potential methods of analysis
 - Key reference sources or software used can be noted as applicable
- Your timeline (e.g. gant chart)
- Expected deliverables based on your analysis
- **Any key questions you want to get feedback on from the case company**
- **Any other information you see relevant**