Advanced supply chain risk management

Capstone: Future-proofing supply chains

Aalto University
School of Business

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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)

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Craighead, C. W., Blackhurst, J., Rungtusanatham, M. J., & Handfield, R. B. (2007). The severity of supply chain disruptions: design characteristics and mitigation capabilities. *Decision Sciences, 38*(1), 131-156.

Christopher, M., & Peck, H. (2004). Building the resilient supply chain. *International Journal of Logistics Management, 15* (2), 1-13.

Svensson, G. (2000). A conceptual framework for the analysis of vulnerability in supply chains. *International journal of Physical Distribution & Logistics Management.*

Zsidisin, G. A. (2003). A grounded definition of supply risk. *Journal of Purchasing and Supply Management*, *9*(5-6), 217-224.

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

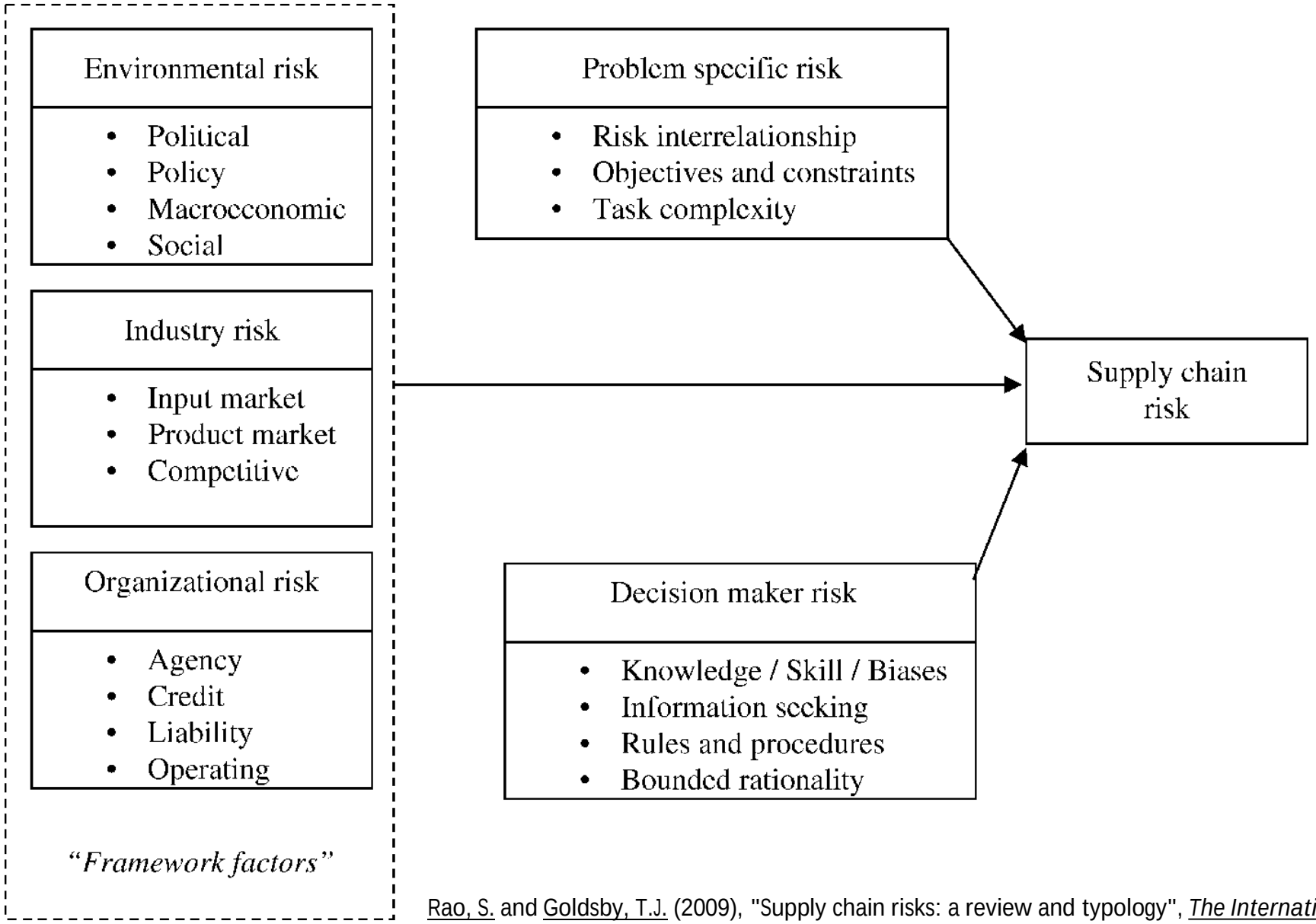
Louis M., Pagell M. (2019) Categorizing Supply Chain Risks: Review, Integrated Typology and Future Research. In: Zsidisin G., Henke M. (eds) Revisiting Supply Chain Risk

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

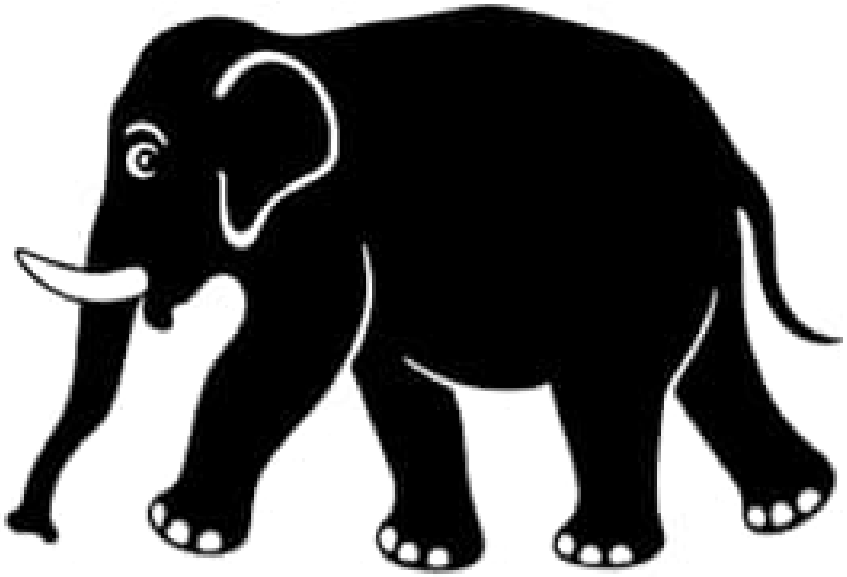
- In SCM e.g., yield, supplier delivery lead times, border crossing times, bad weather, and labor strikes

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

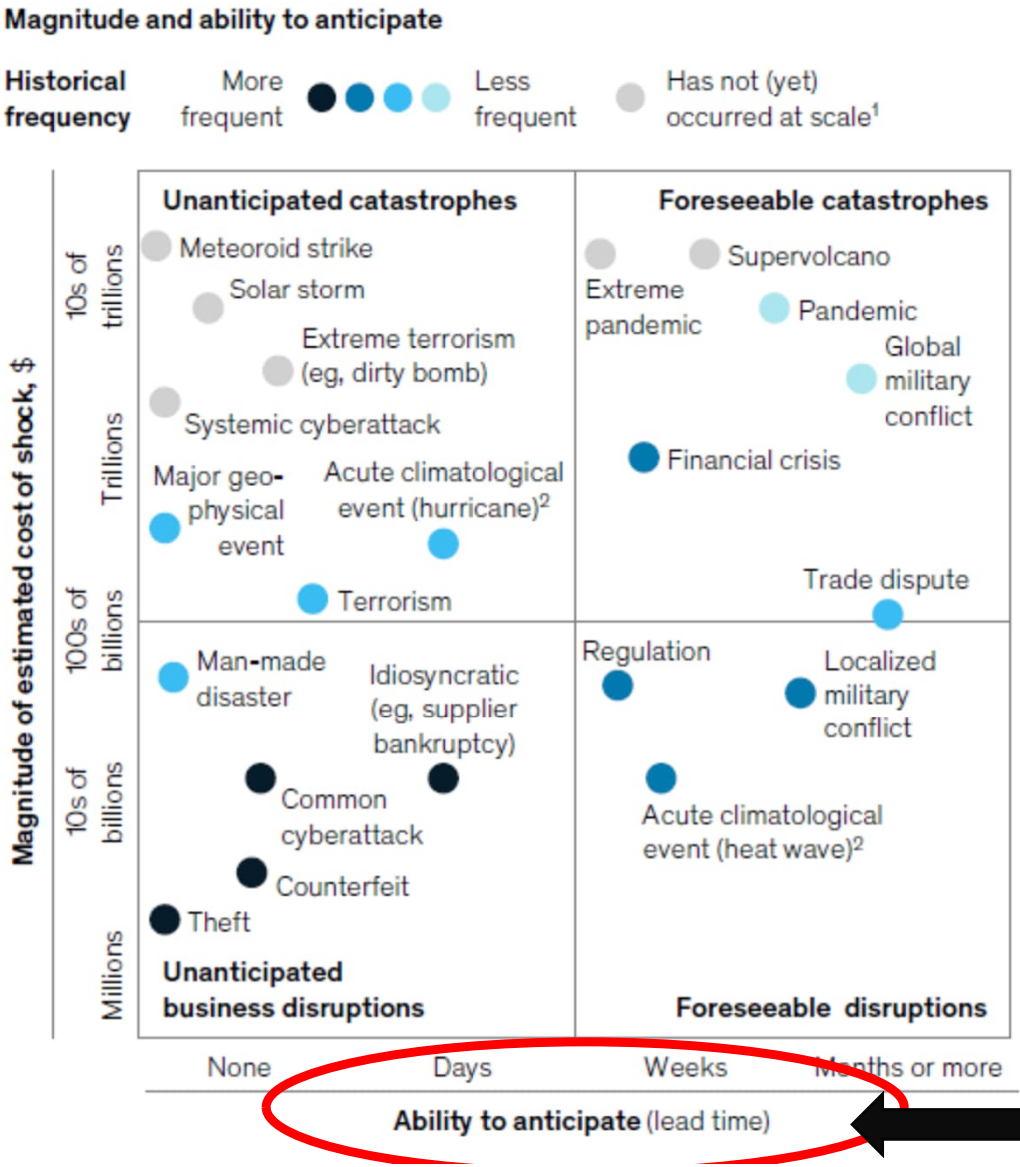
How can a supply chain manager prepare for unknown unknowns?

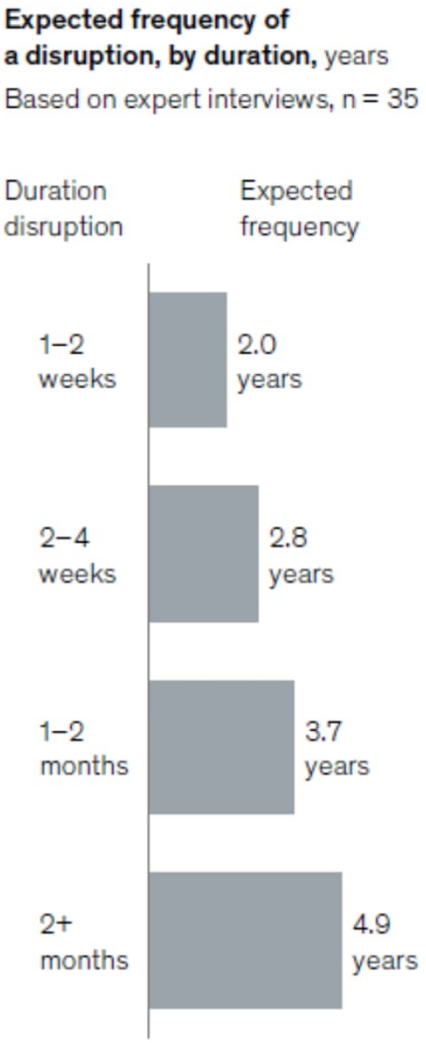
Which should you actually worry about?



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

McKinsey Global Institute 2022

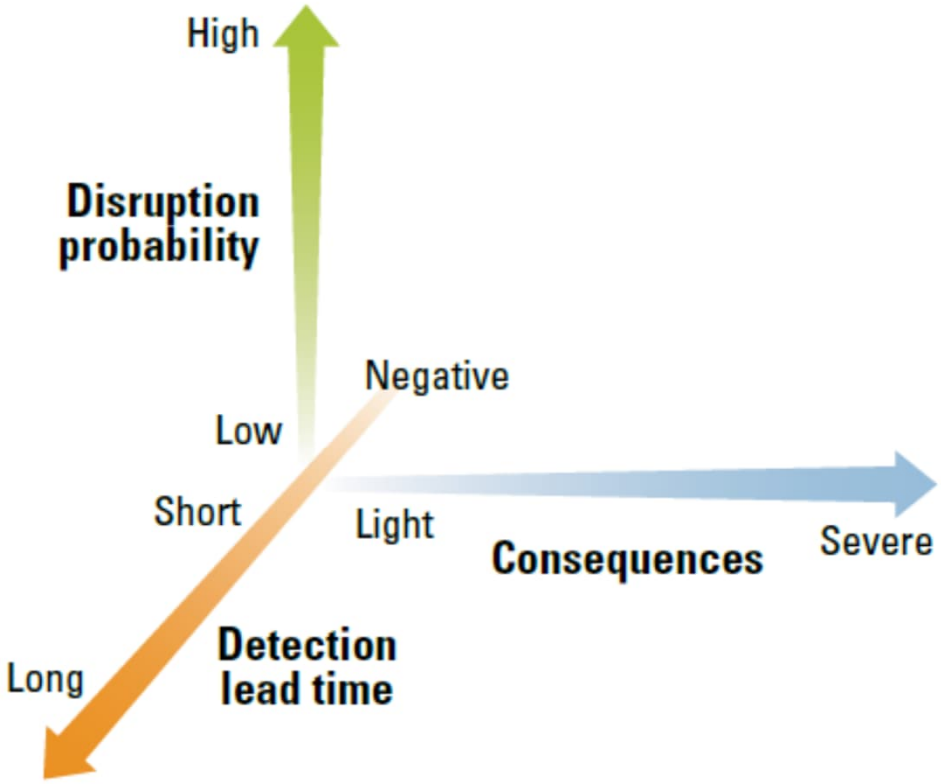




Here is where the difference is made!

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!!

Sheffi 2015

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

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

Supply chain resilience playbook

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

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 measure-ments that are unique

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

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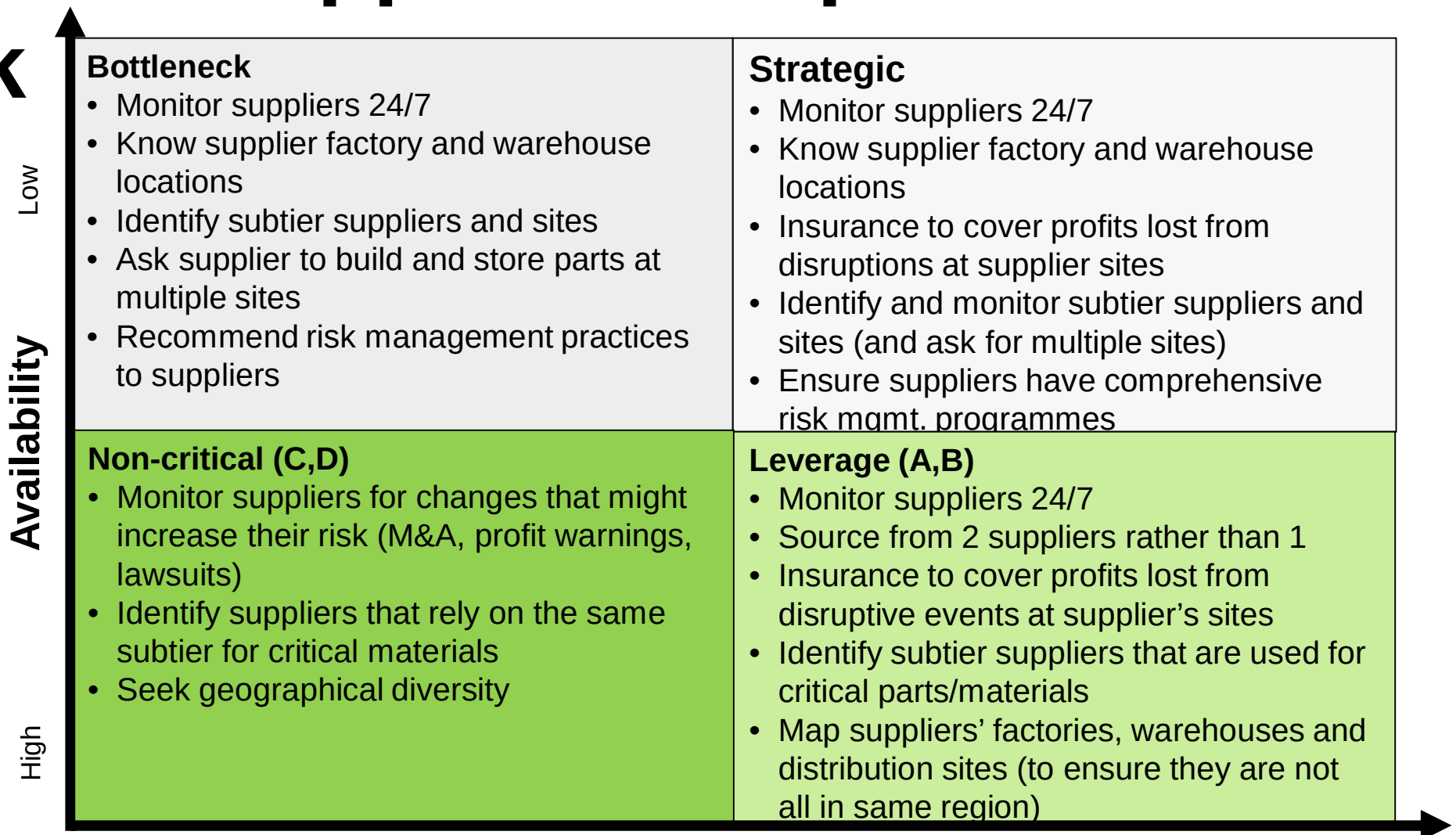
Portfolio approach to procurement risk



Source: Resilinc

Learn to manage complexity & uncertainty

Analytics: internal and external

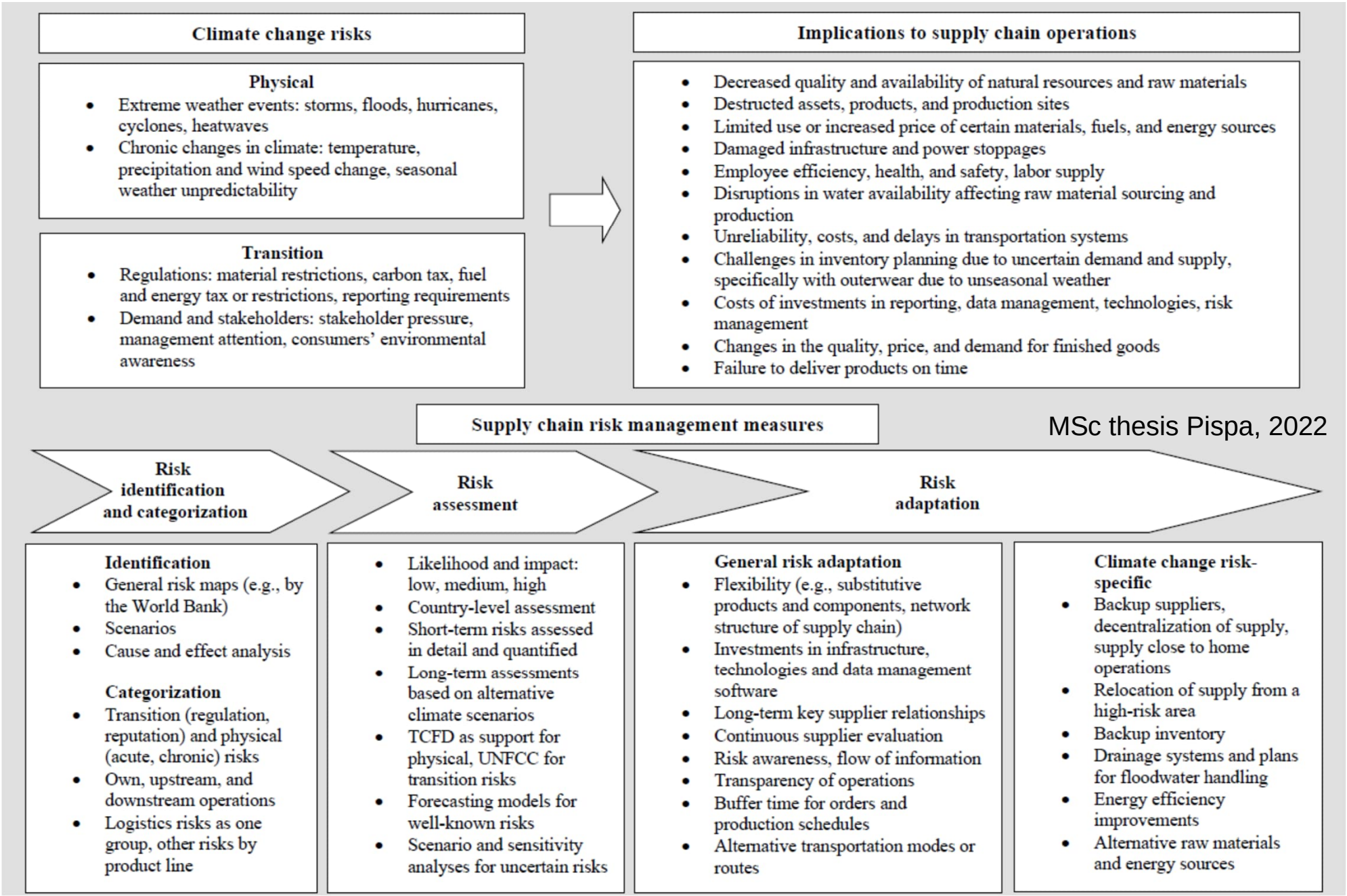
- Increased spend visibility through systems and analytics
- Market intelligence, supplier health checks, weather & political monitoring
- Understand, forecast, make decisions

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



MSc thesis Pispa, 2022

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**