Marine Transportation Systems (MTS) Resiliency and Continuity of Operations

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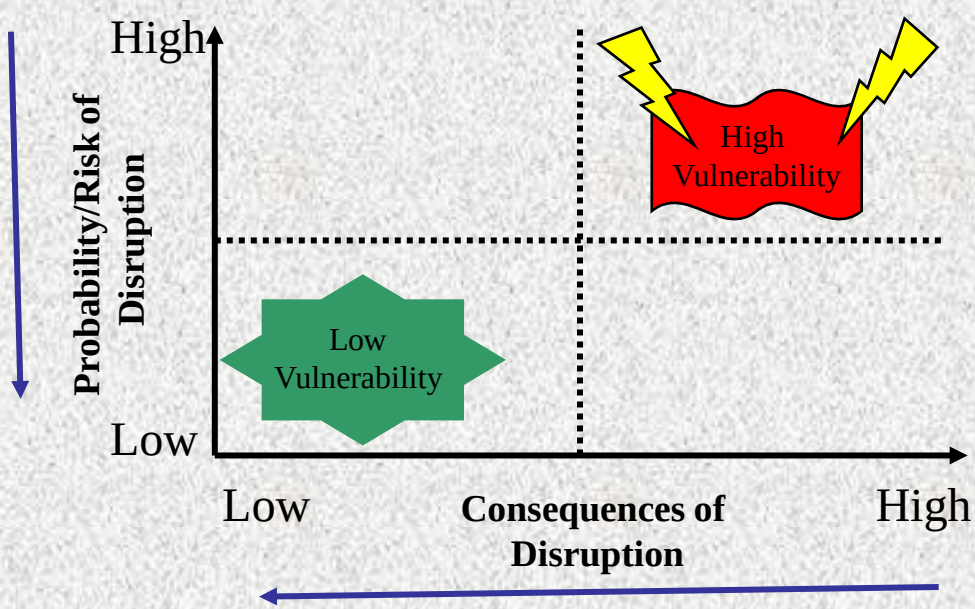
Insights from Supply Chain Security & Resilience

- Vulnerability = f(probability & consequence)
  - Reduce probability via security, early warning systems
  - Reduce consequences via resilience
    - Resilience = ability to regain (or recreate) prior capability
    - Not just short-term response
    - Requires advance planning, additional capabilities/capacity
    - Design systems for resilience



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    - Design systems for resilience
  - Achieve resilience via flexibility and/or redundancy
    - But how much of each?
    - Flexibility = crosstrained workforce, multi-product production systems, system designed with late customization (postponement)
    - Redundancy = carrying inventory, maintaining capacity above average demand requirements, back-up suppliers
- Supply Chain Failure Modes
  - These are the systems that need to be resilient

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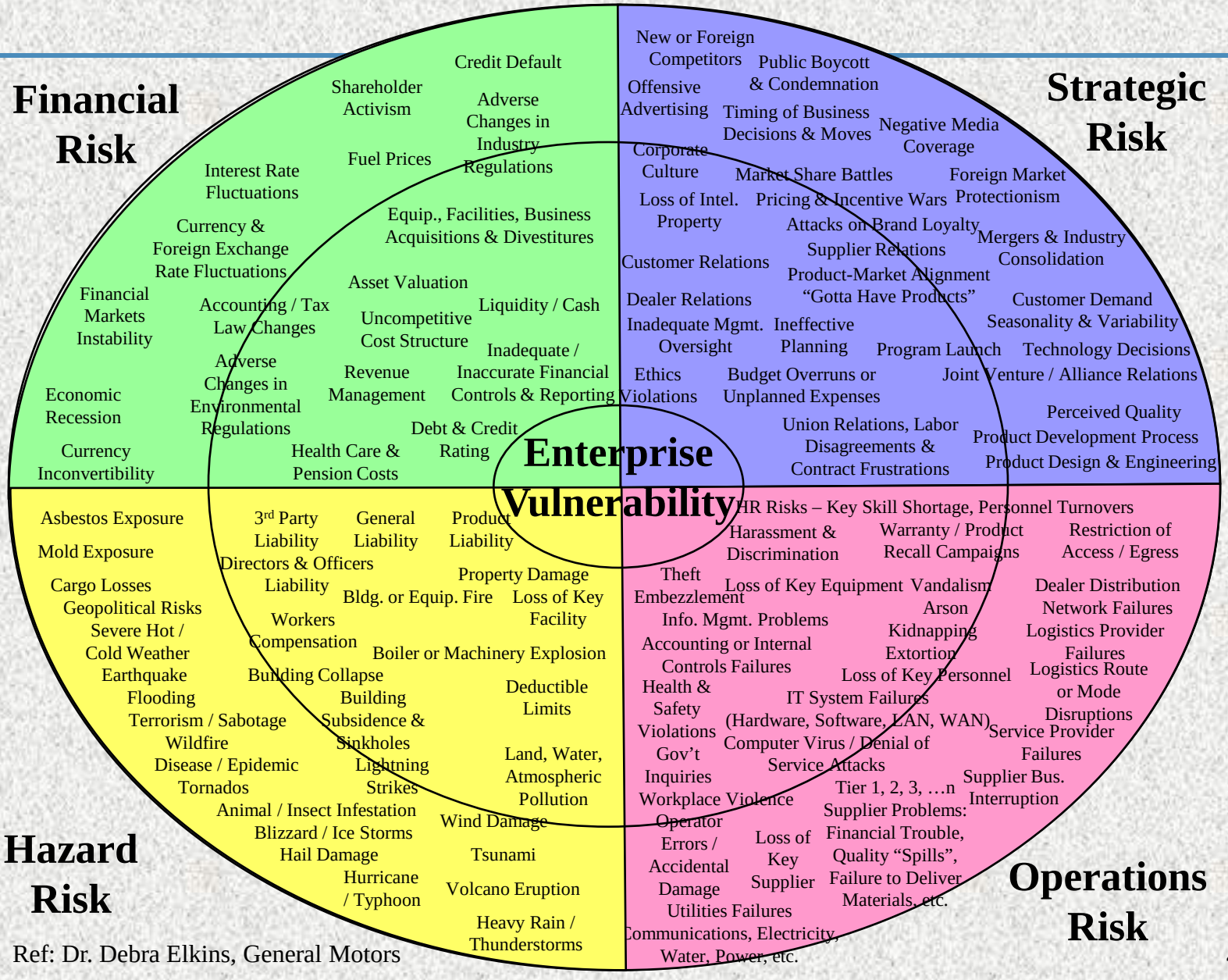
Assess Vulnerabilities



Ref: Dr. Debra Elkins, General Motors

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Failure Mode Analysis

Disruptions result in a loss of:

- Capacity to acquire materials (supply)
- Capacity to ship/transport
- Capacity to communicate
- Capacity to convert (internal operations)
- Demand (market, customer failure)
- Human resources (personnel)

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Principles of Resilience: Reduce the Consequences

- Business Continuity Planning (BCP)
  - **Design to 'fail smartly' – the system WILL fail; plan to fail so that the damage is not crippling**
  - **Focus on Failure Mode Analysis, not source**
  - **"Options" thinking and planning**
- Create Supply Network Resilience
  - Ability of supply network to sustain variations in supply and demand, and to recreate itself after disruption
  - Achieve through Flexibility and Redundancy
- Flexibility
  - Responding through actions that entail prior investments in infrastructure and capabilities
- Redundancy
  - Responding through actions that entail prior investments in capital and capacity **that may not be used**

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Many Pathways to Flexibility

- Flexibility through interchangeability
  - Standard facilities (Intel, GM)
  - Standard parts (Dell, Lucent SCN, Southwest Airlines)
  - Standard processes (Helix, UPS)
- Flexibility through postponement (Benetton, H-P)
- Flexibility through supply (Jabil, Lucent, Toyota)
- Flexibility through distribution (Caterpillar, Dell)
- Flexible culture
  - Awareness of risks, tradeoffs
  - Early warning systems (Nokia)
  - Education for awareness
  - Training for response (Intel)
  - Distributed decision-making (P&G, UPS)
  - Open and unconstrained communication (Dell)

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Sources: "SC Response Project Interim Report" by J. Rice, F. Caniato, Aug 8, 2003; Draft of SC Response Book project, Oct. 2004, later pub as "The Resilient Enterprise by Y. Sheffi

SC Risk Management Maturity Levels

Ultimate Economic Viability

Low Probability but High Consequences

Not disadvantaged but not leveraging potential; high probability and consequence, C-TPAT Compliant

Economic viability at risk:
High prob & consequence, disadvantaged vs C-TPAT compliant competitors

Pre-Compliant

- Not C-TPAT compliant
- Secure facility, ltd prevention

Compliant

- Response to regulations
- Security as cost of business.
- Standard transborder movements

Secure

- Outside stds insufficient
- Emphasize security & prevention to help company protect its economic viability
- Security seen as part of business model

Resilient

- Business strategy leverages supply chain and security investments for comp advantage
- Disruption seen as inevitable, focus on resilient supply chains.
- Manage risk via secure, resilient, efficient, effective transborder processes

Ref:"How Risk Management Can Secure Your Business Future", *Supply Chain Strategy*, June/July 2007 by James B. Rice, Jr. (MIT) & William Tenney (Target)

How do these apply to MTS Component Resilience?

- Creating secure and resilient MTS
  - Which concepts can be reapplied?
  - What additional concepts are important?
- What are the pertinent failure modes for each MTS component?
  - Navigable waterways
  - Ports
  - Vessels
  - Intermodal connections
  - Users
- What makes MTS components flexible? Redundant?
- The Port Risk Management Maturity Model?

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Currently

- Survey on MTS port resilience
  - In conjunction with researchers from Polytecnic University of Catalonia
  - Who: Shippers, carriers, terminal operators, port authorities, key third parties
  - What:
    - Input re: port processes and capacity that need to be resilient
    - Their experience with disruptions in port operations
    - Their recommendations for making ports resilient
  - Findings will direct subsequent steps to further study and pursue

- Preliminary model and framework development

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Thank you….

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