Strategic Approach for Assessing Supply Chain Resilience Investment Options

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Sponsor: MIT

MIT GLOBAL SCALE NETWORK

Background / Motivation

3.7 **Average years between supply chain disruptions** lasting 1+ months

Companies across the globe have lost billions of dollars due to Covid-19 and other supply chain disruptions, according to *Accenture* and *McKinsey**

94% of Fortune 1000 companies are **seeing supply chain disruptions** from COVID-19

75% of companies have had **negative or strongly negative impacts on their business**

- Current research: **no standard methodology** to determine **actions that will generate most value** for a firm in response to supply chain disruptions

Key Questions

1. How to determine the most impactful resilience action in a supply chain network?
2. How to quantify the value of supply chain resilience actions that will increase a firm's level of resilience?

Relevant Literature

- Macdonald, J. R., et al. (2018). Supply chain risk and resilience: Theory building through structured experiments and simulation
- Mathews, S., et al. (2007). A practical method for valuing real options: The Boeing approach
- Ramirez-Marquez, J. E., et al. (2018). Quantifying the resilience of community structures in networks

*Supply Chain Disruption & How to Respond | Accenture. (n.d.). Retrieved January 9, 2022, from https://www.accenture.com/us-en/insights/consulting/coronavirus-supply-chain-disruption
Risk, resilience, and rebalancing in global value chains | McKinsey. (n.d.). Retrieved January 9, 2022, from https://www.mckinsey.com/business-functions/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains



Methodology

STEP 1: Collect data around the potential performance impact of disruption for all nodes of a particular supply chain (Value at Risk (VAR))

STEP 2: Conduct sensitivity analysis to understand which elements of a supply chain's node's value at risk benefits the resilience of the network the most if adjusted

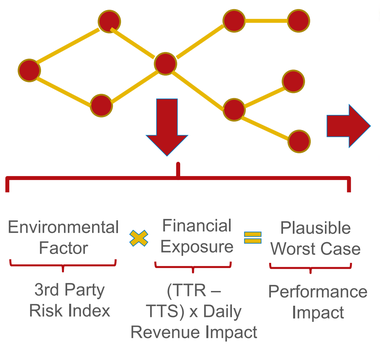
STEP 3: Identify how industry addresses vulnerabilities during disruptions (resilience options) and identify specific actions relevant to step 2

STEP 4: Understand how supply chains fail, and characterize disruption impacts for the network (failure modes)

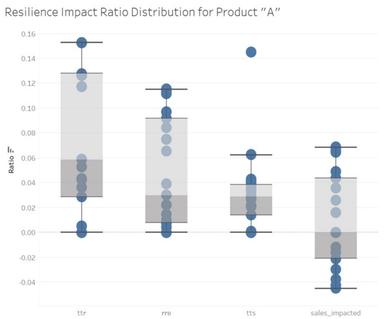
STEP 5: Use Monte Carlo simulation to model the range of outcomes from the impact of node failure among various resilience options

Results

Network of Nodes



Sensitivity of Resilience Variables



*TR = Time for a node to respond to disruption
TTS = Time a node can survive after a disruption

$$\text{Resilience Impact Ratio} = \frac{\%\Delta \text{ in Central Tendency}}{\%\Delta \text{ in Node Input}}$$

Contribution

- **Address gaps in research** on **assessing the value of resilience actions** for a business line
- **Assess and characterize** specific resilience **actions as investment options**
- **Identify a roadmap** to incorporate **maximum monetary** investment for a particular option
- **Encourage** stakeholders to **better understand the value proposition of a resilience-based approach** to capital investments versus a risk management approach



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