Understanding the Complexity of Emergency Supply Chains

North Dakota State University presentation for Ph.D. students & faculty

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Agenda

- Complex versus complicated
- Defining emergency supply chain
- Sources of complexity within military expeditions
- Common sources of complexity
- Areas of further study

- A proposed model for evaluating effective supply chains

- Thoughts
- Discussion

Complicated vs. Complex

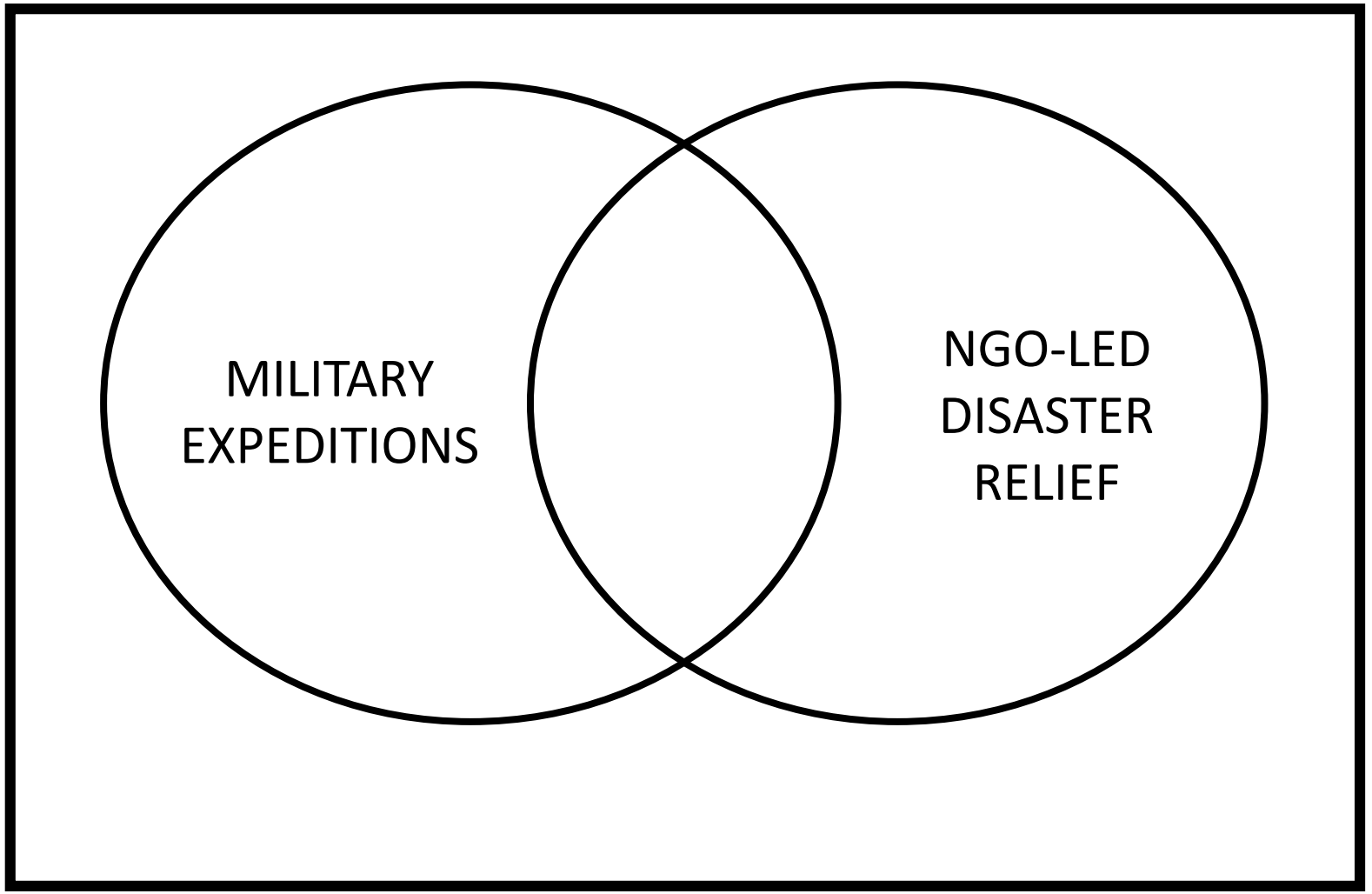
- *Complicated:* "Things that are complicated have many parts, but those parts are joined, one to the next, in relatively simple ways…they ultimately can be broken down into a series of neat and tidy **deterministic** relationships."

- *Complex:* "Complexity, on the other hand, occurs when the number of interactions between components increases dramatically—the interdependencies that allow viruses and bank runs to spread; this is where things quickly become **unpredictable**."

--General (Ret) Stanley McChrystal

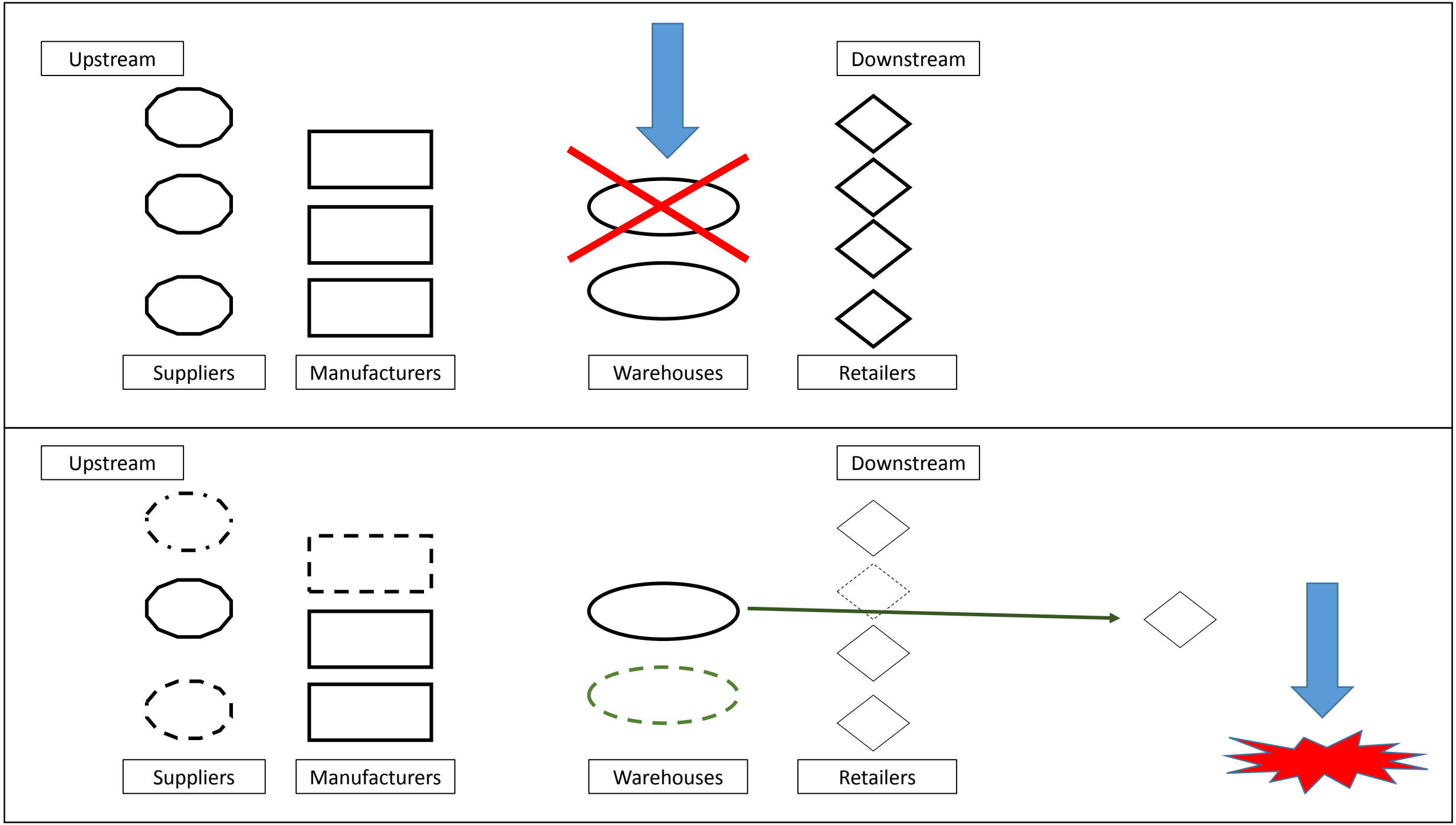
"Team of Teams" (2005)

Defining emergency supply chains: a framework



Defining emergency supply chains: inherent characteristics

- Born from crisis (urgency)
- Effectiveness vs. efficiency; “at all costs.”
- Disruption vs. emergency; “on the fly.”
- Disruption versus responsiveness
- Non-applicability of strategies
  - Robustness, proactive
  - Agile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Manufacturers
Warehouses
Retailers
Upstream
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Suppliers
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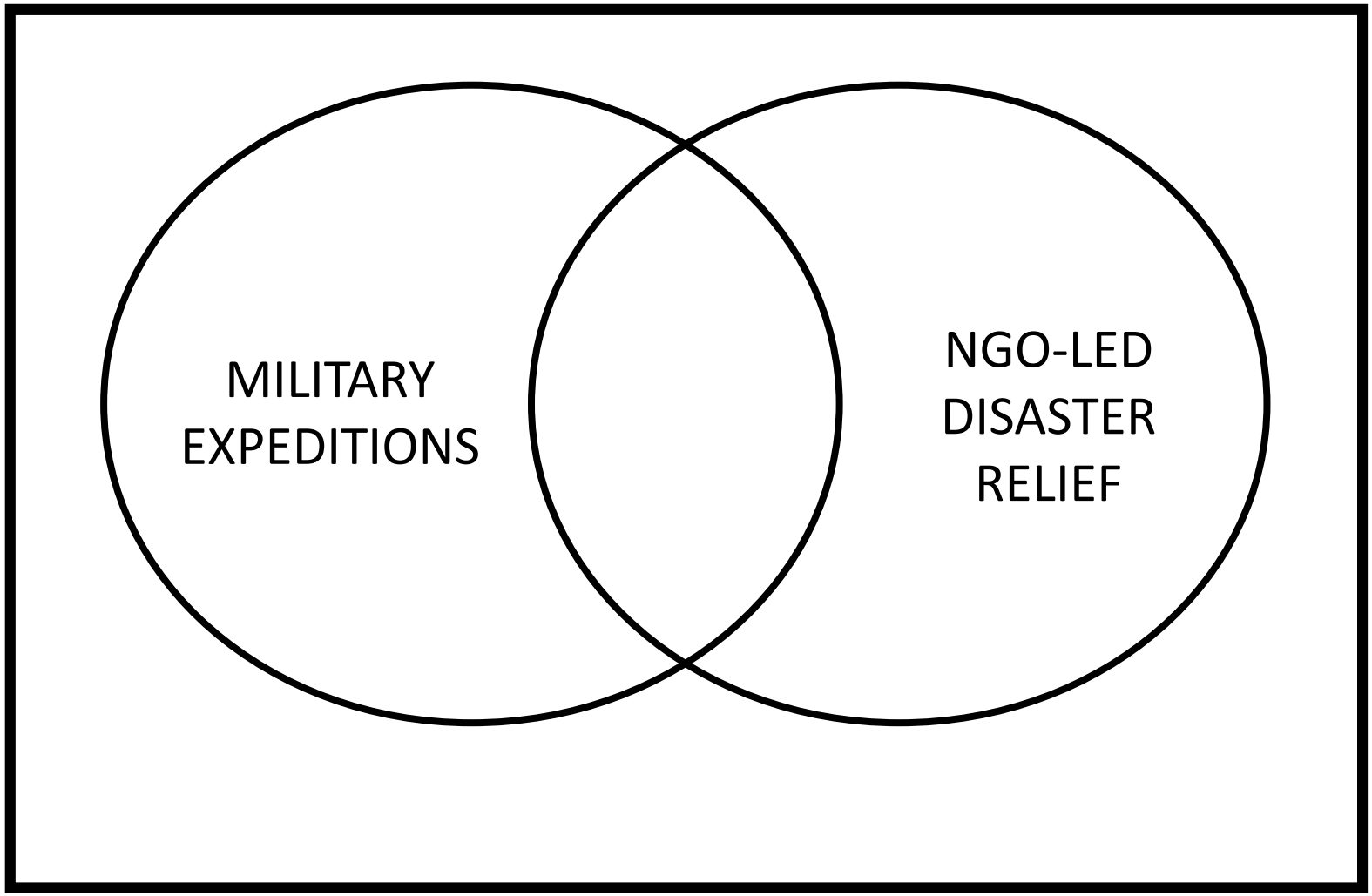
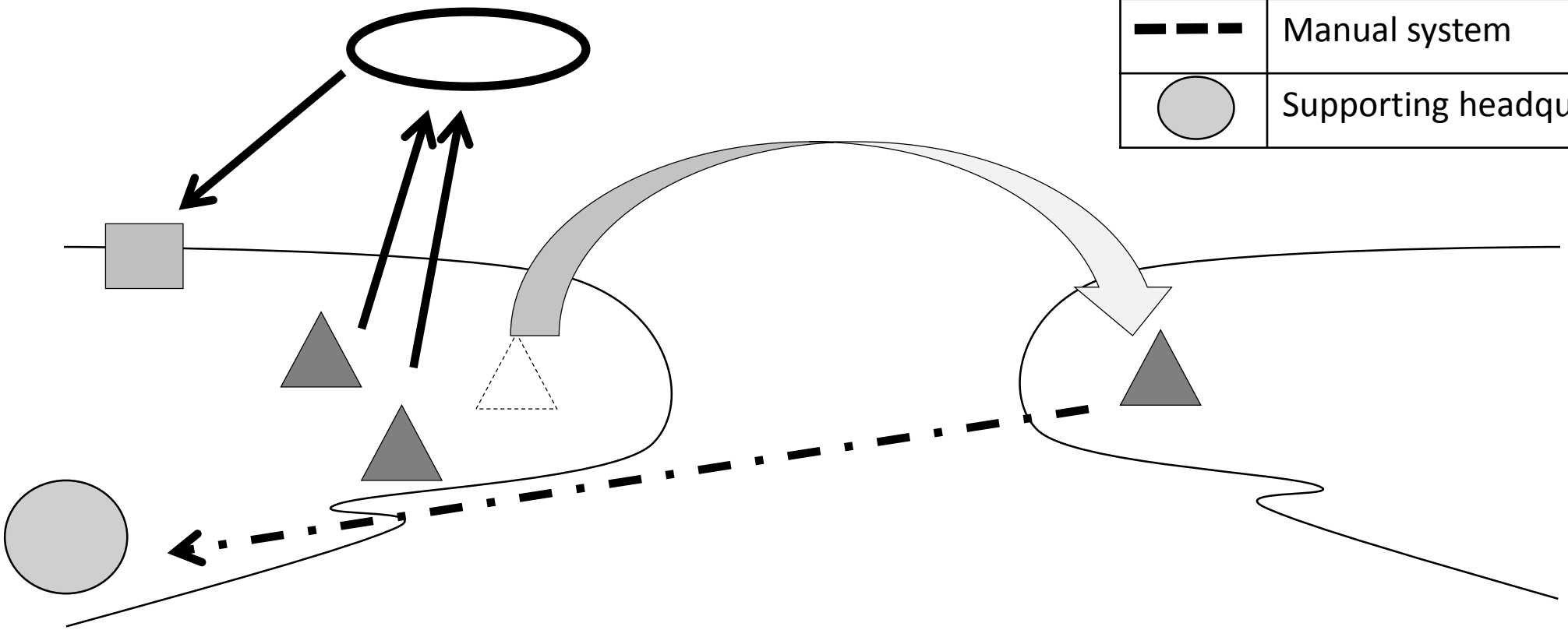
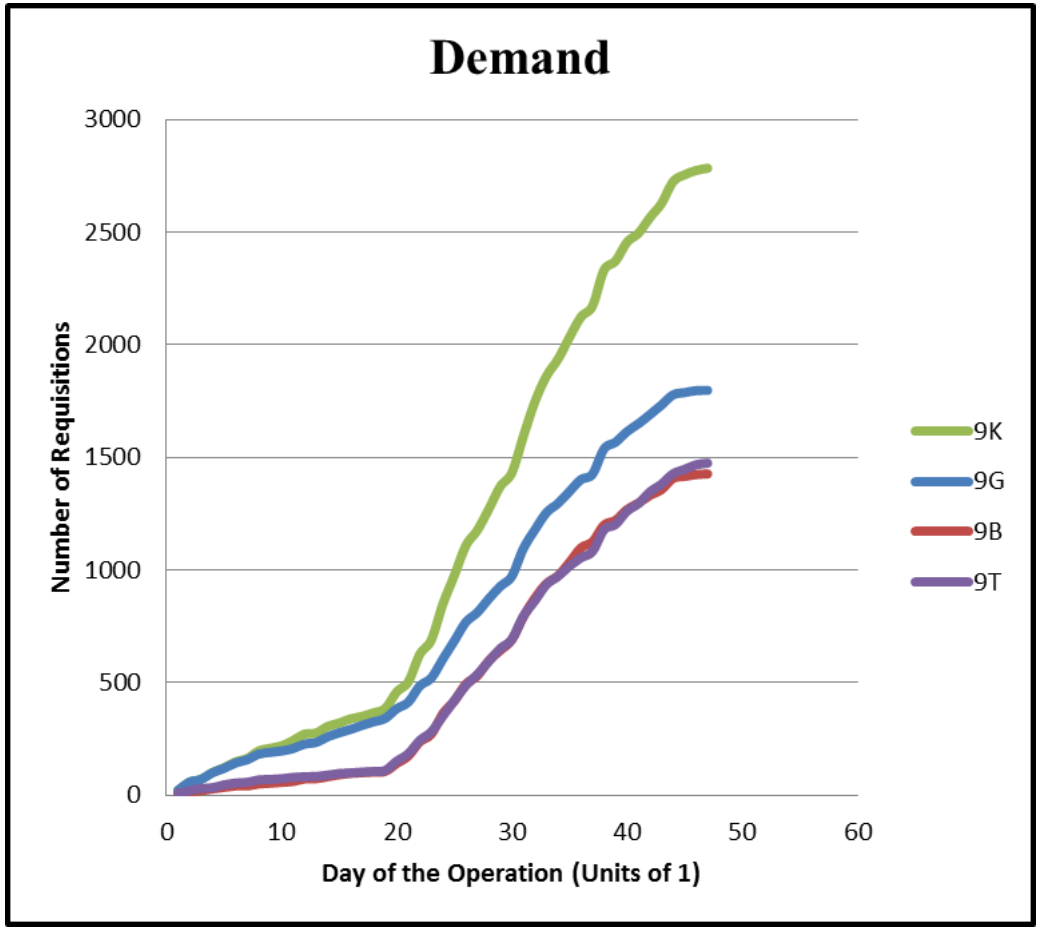
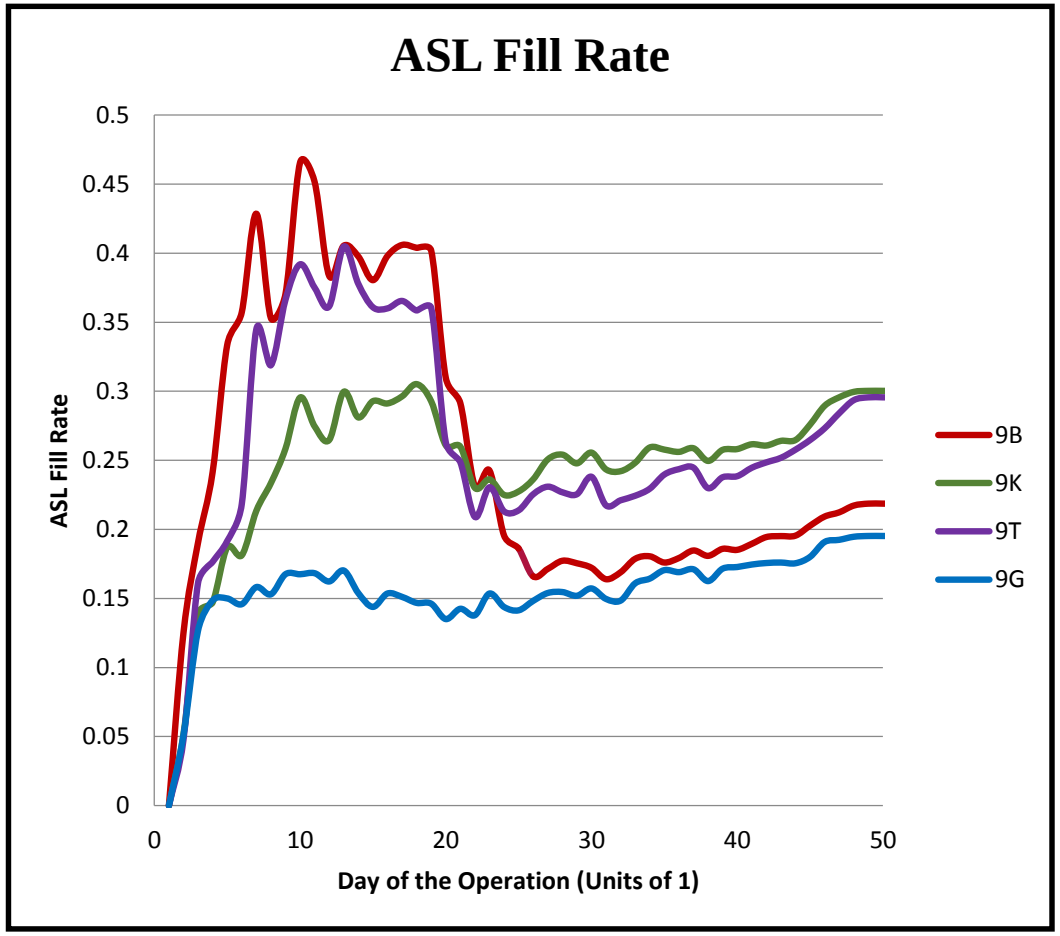

MILITARY
EXPEDITIONS
NGO-LED
DISASTER
RELIEF

Establishing the military expedition supply chain

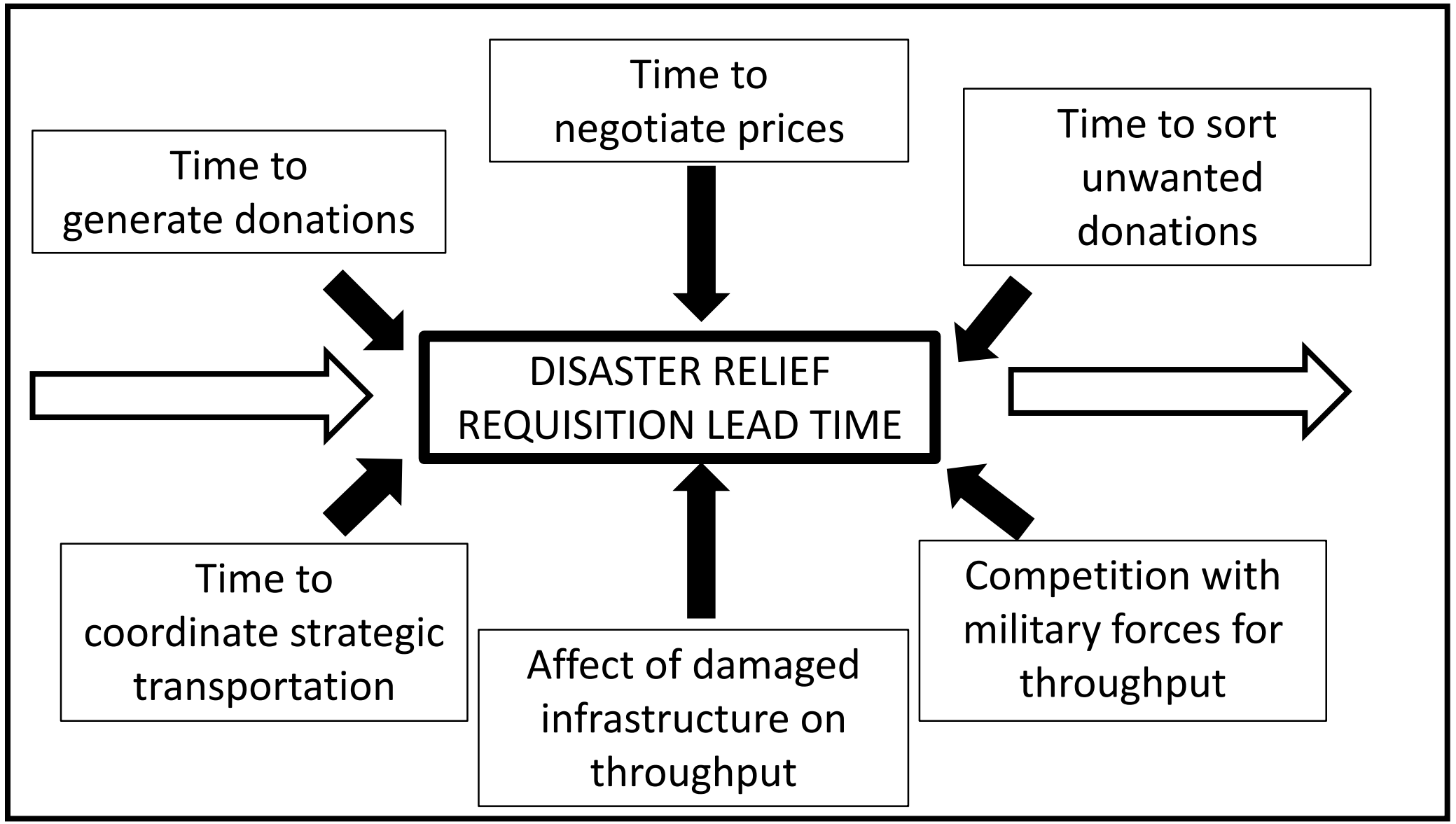


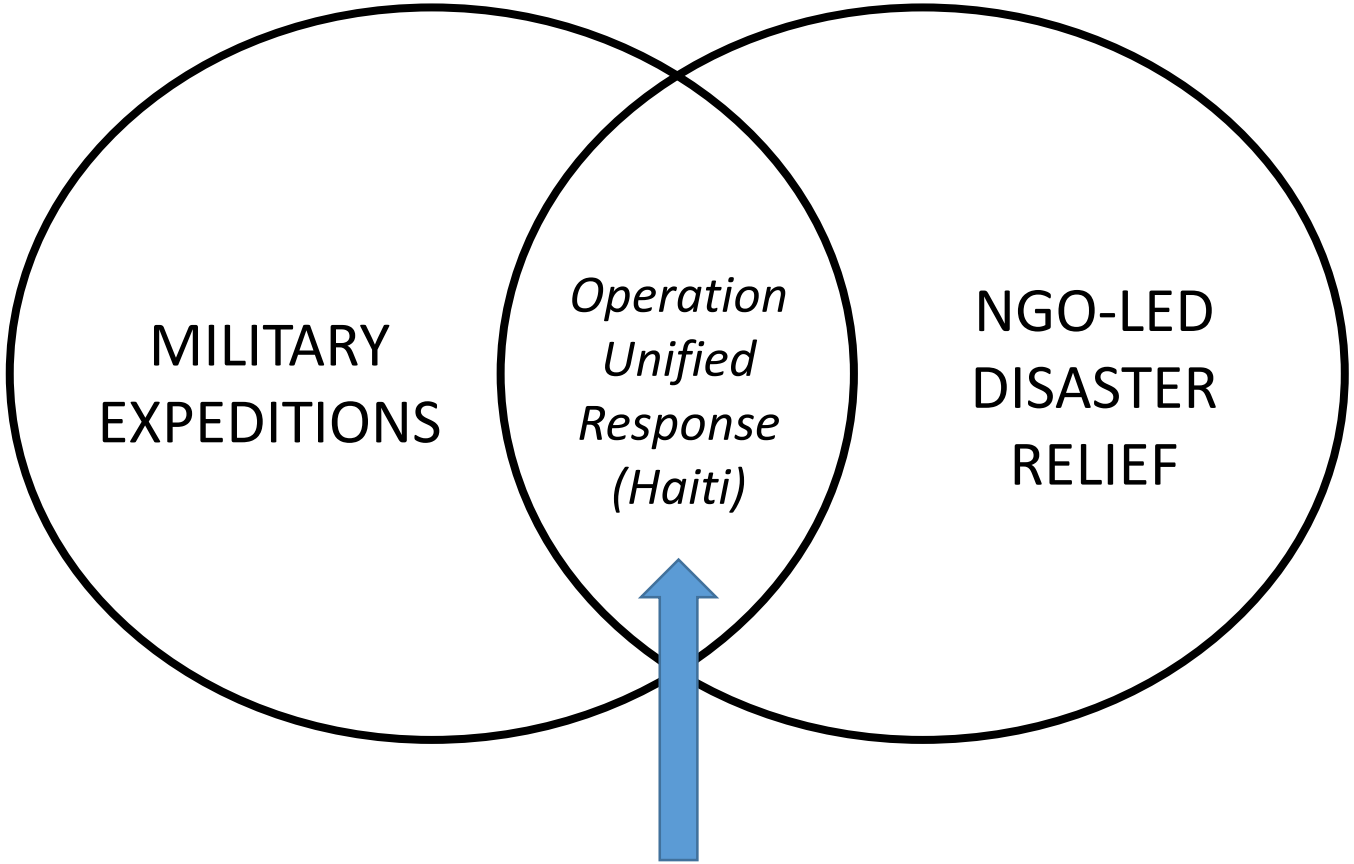
Retail stocks on hand's ability to meet military expeditionary demand





Impacts on disaster relief requisition lead time



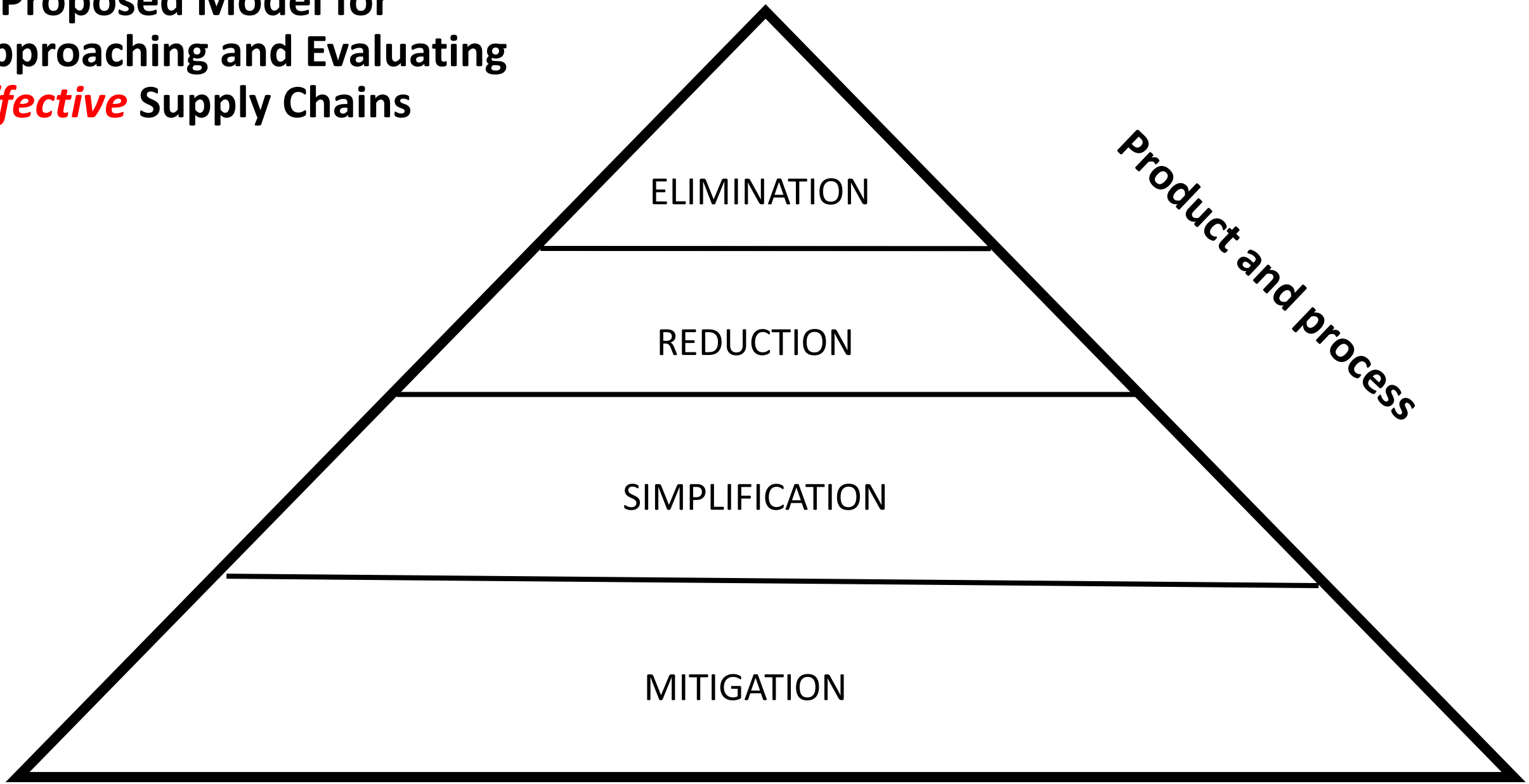


Two parallel supply chains, contributing towards the same desired outcome, but not necessarily in unison

Areas for further study

- Tempo and nature of decoupling points within emergency supply chains
- Efficacy of establishing supplementary stockage listings for military expeditionary forces
- Efficacy of additive manufacturing for emergency supply chains
- Efficacy of emerging methods of sensing, forecasting and responding to emergency supply chain demand

A Proposed Model for Approaching and Evaluating *Effective* Supply Chains



(Shatzkin, 2017)

Thoughts

- The future: Data science, omni-channel, predictive analytics

- Simulation, statistics, computer science and software
- Focus, feasibility, patience, tempo, balance
- Fear of not knowing

Discussion