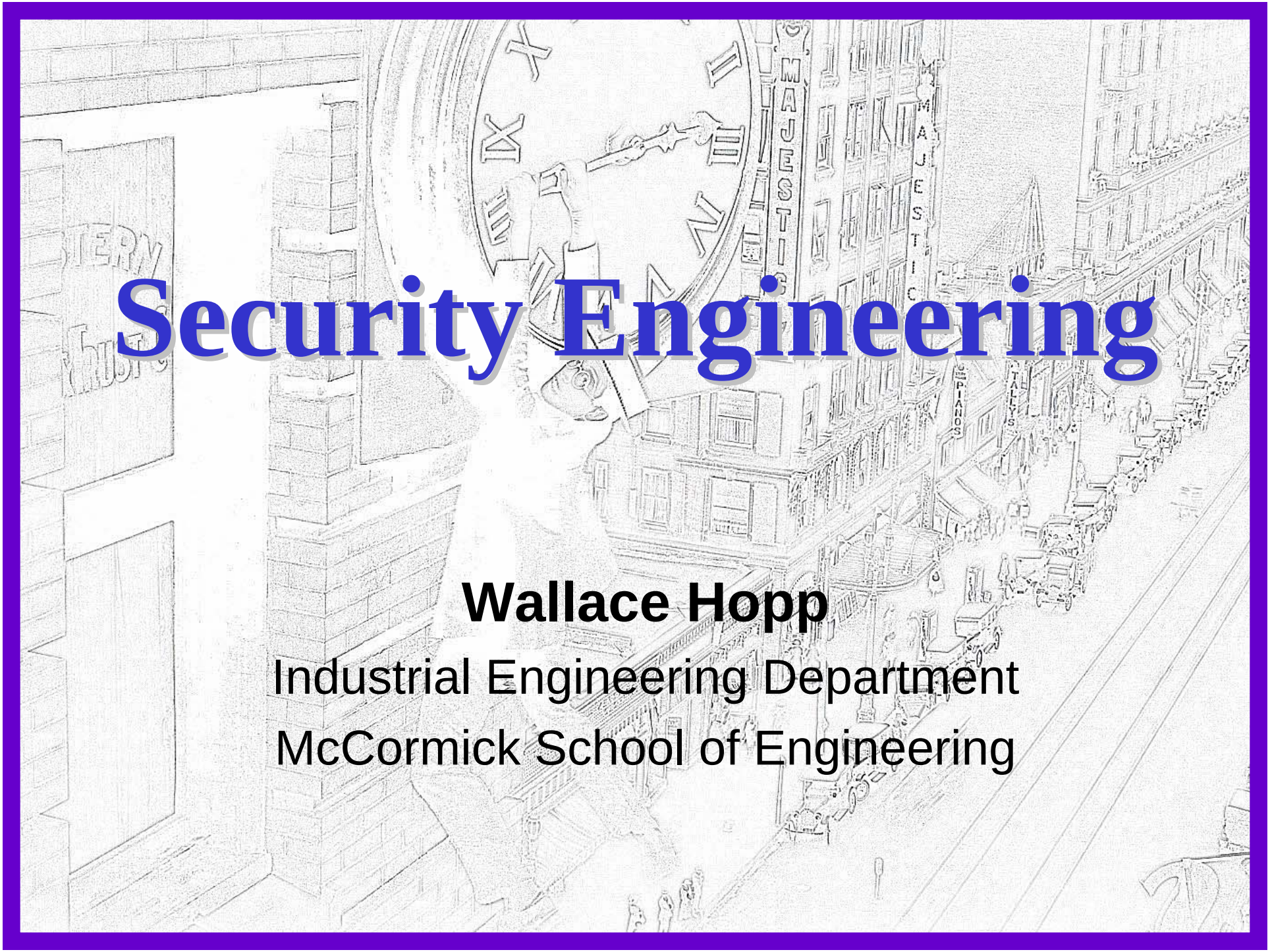


Security Engineering

Wallace Hopp

Industrial Engineering Department

McCormick School of Engineering

A Flat World is an exciting but dangerous world…

Technology Advances

Reduced Political Barriers

Global Business Practices

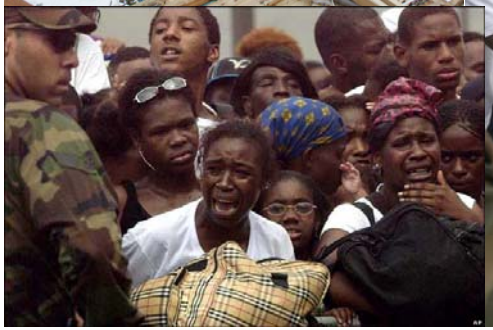
Opportunity

Risk

Terrorism

Accidents in remote plants can have large consequences for a supply chain…

Natural Disasters can disrupt business around the globe…



Terrorism has a wider reach than ever before…

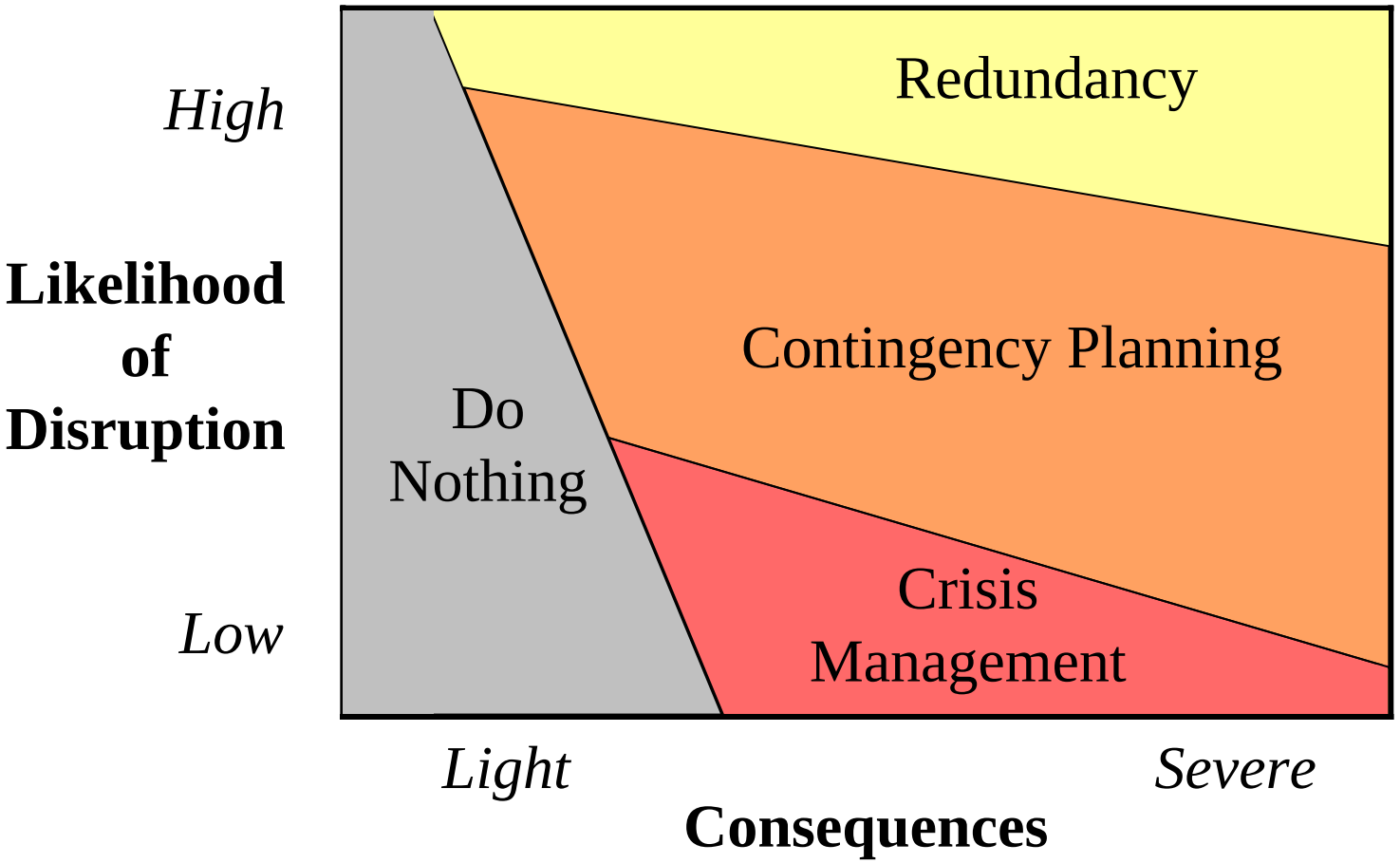
A basic principle from Factory Physics is central to security engineering

Buffering Principle: *Systems with variability must be buffered by some combination of:*

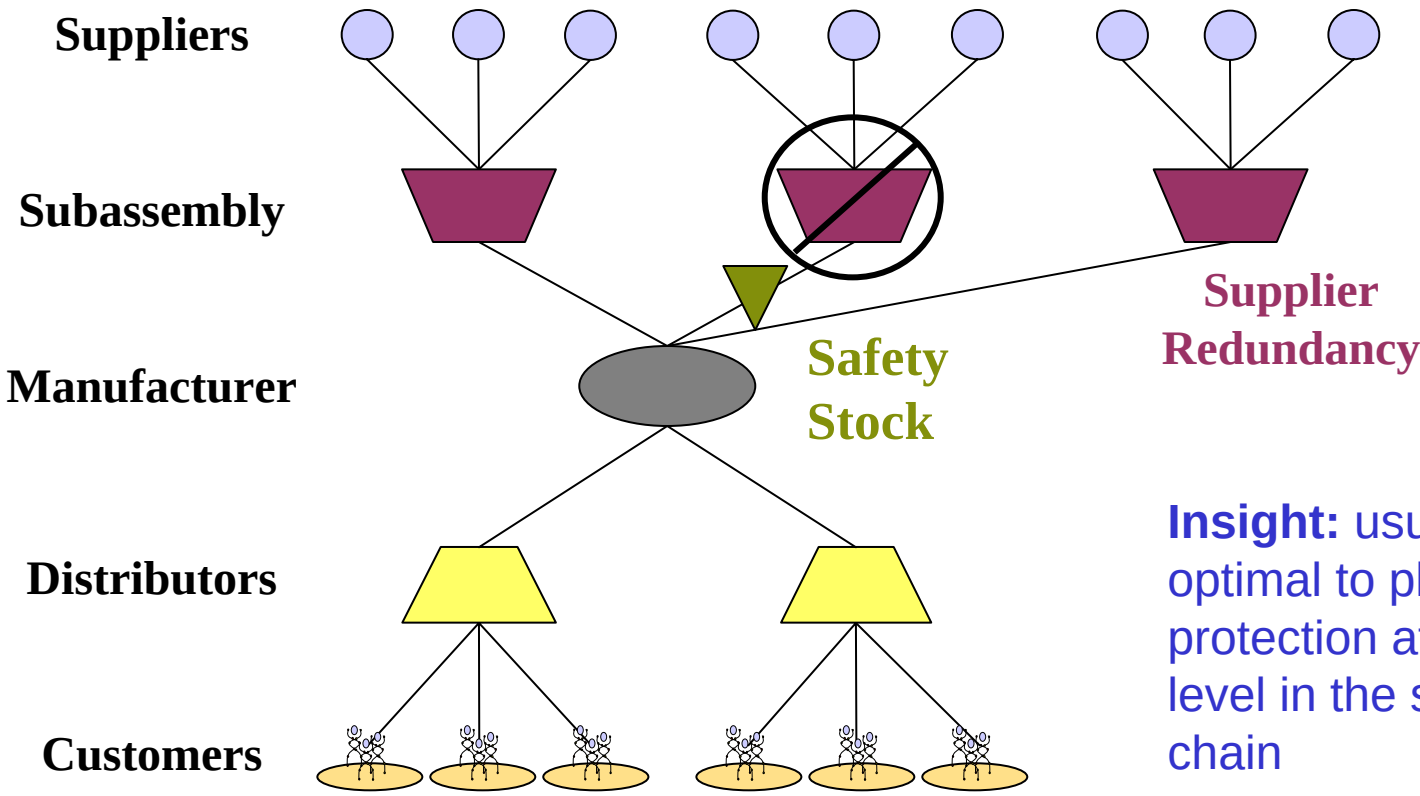
1. *inventory* 
2. *capacity* 
3. *time.* 

Buffer Flexibility Corollary: *Flexibility reduces the amount of variability buffering required in a production system.*

Strategies for dealing with risks depend on likelihood and severity of event



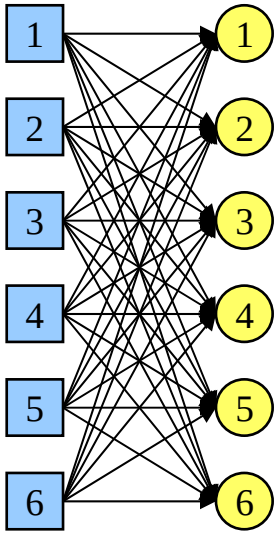
Redundancy in a supply chain can be either inventory or capacity



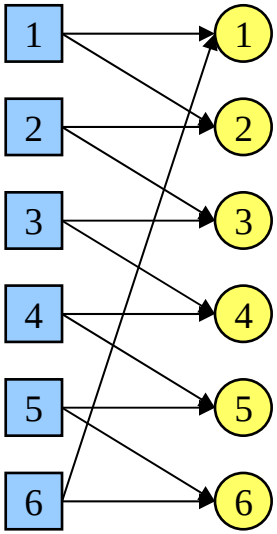
Insight: usually optimal to place protection at a single level in the supply chain

Flexible buffers are more effective than rigid ones

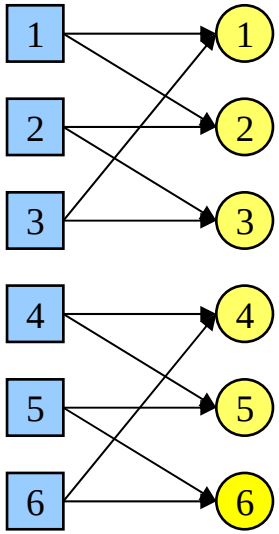
Full Flexibility



Chained Flexibility

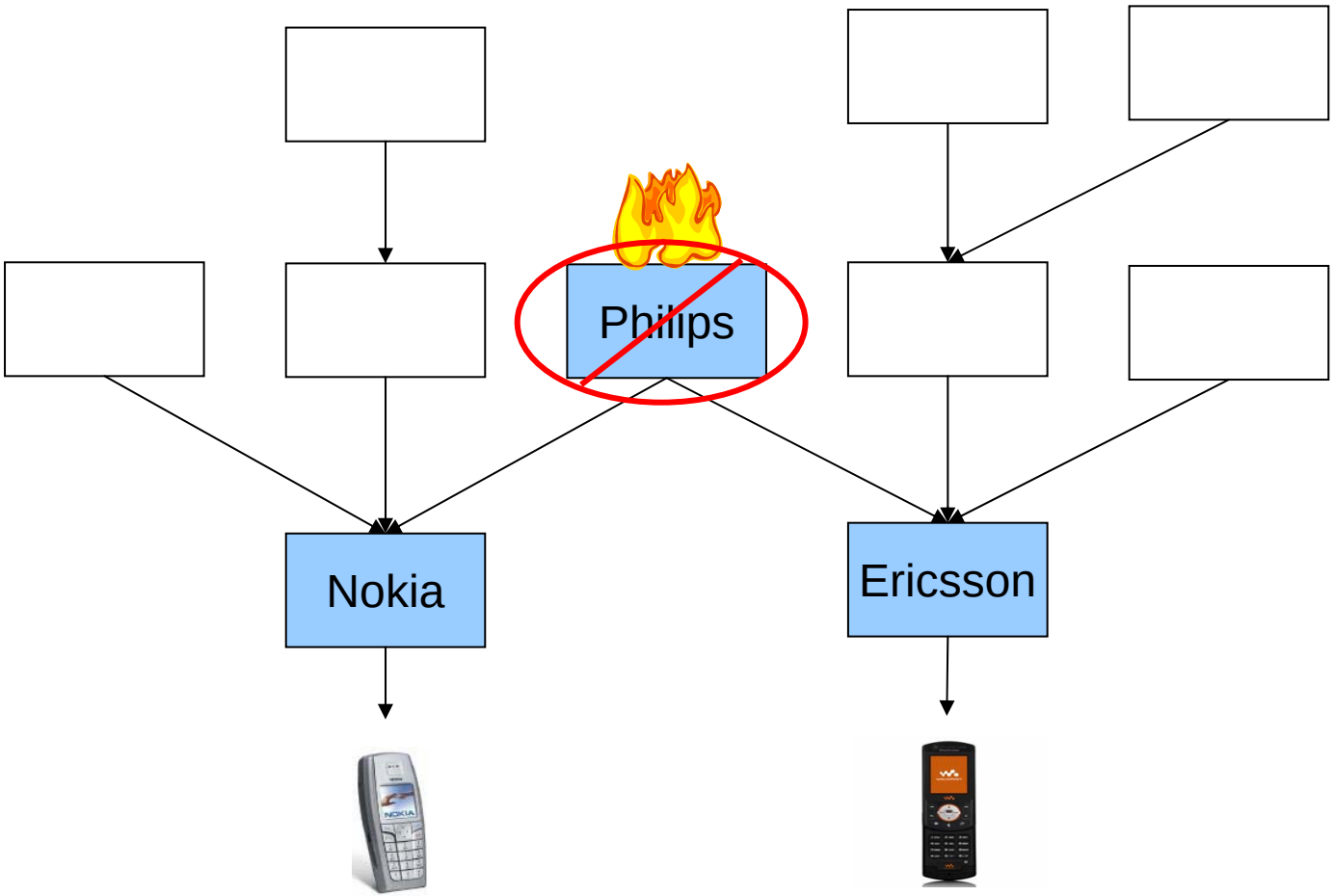


Sub-Chained Flexibility

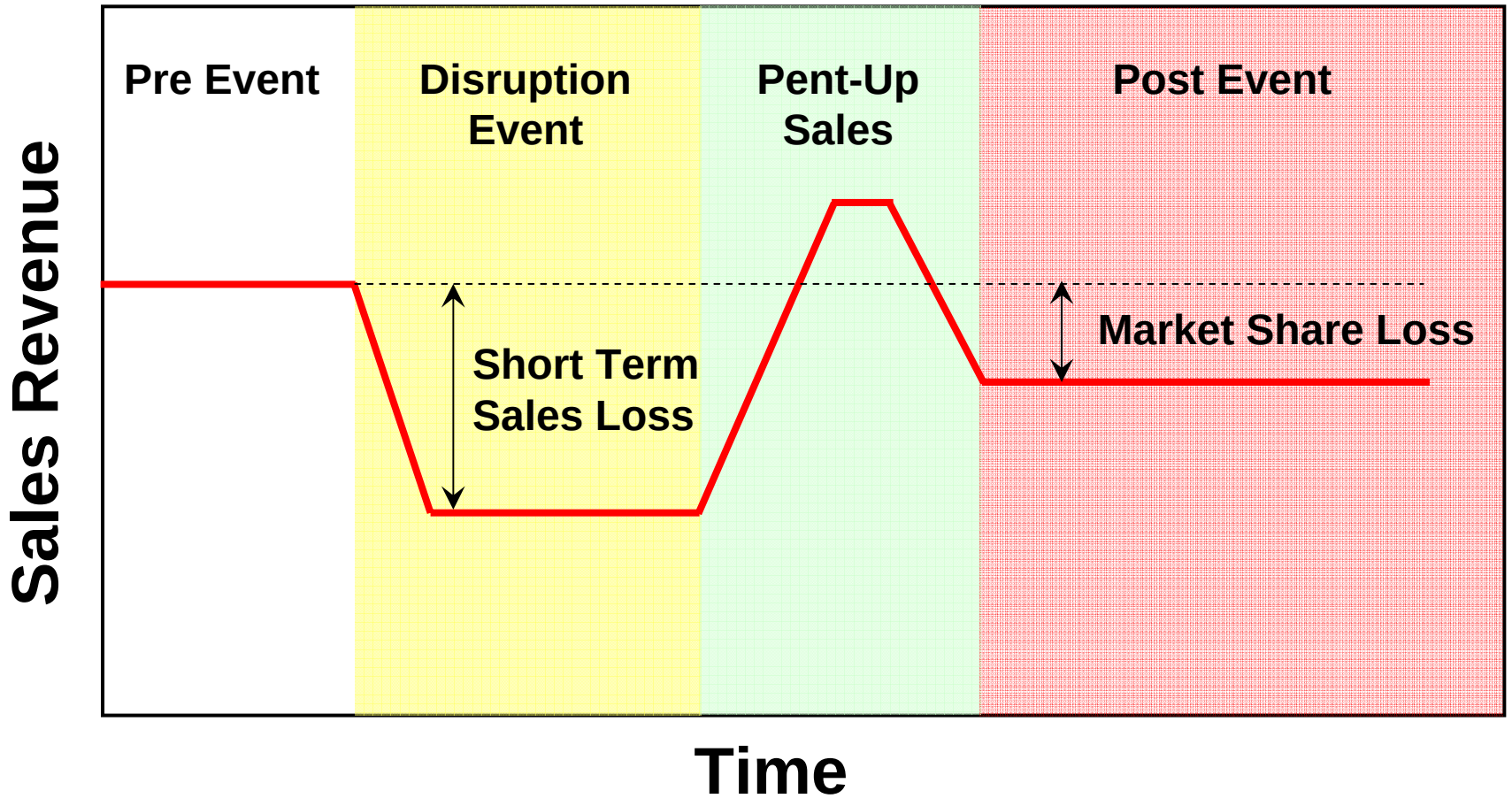


production plant **demand type**

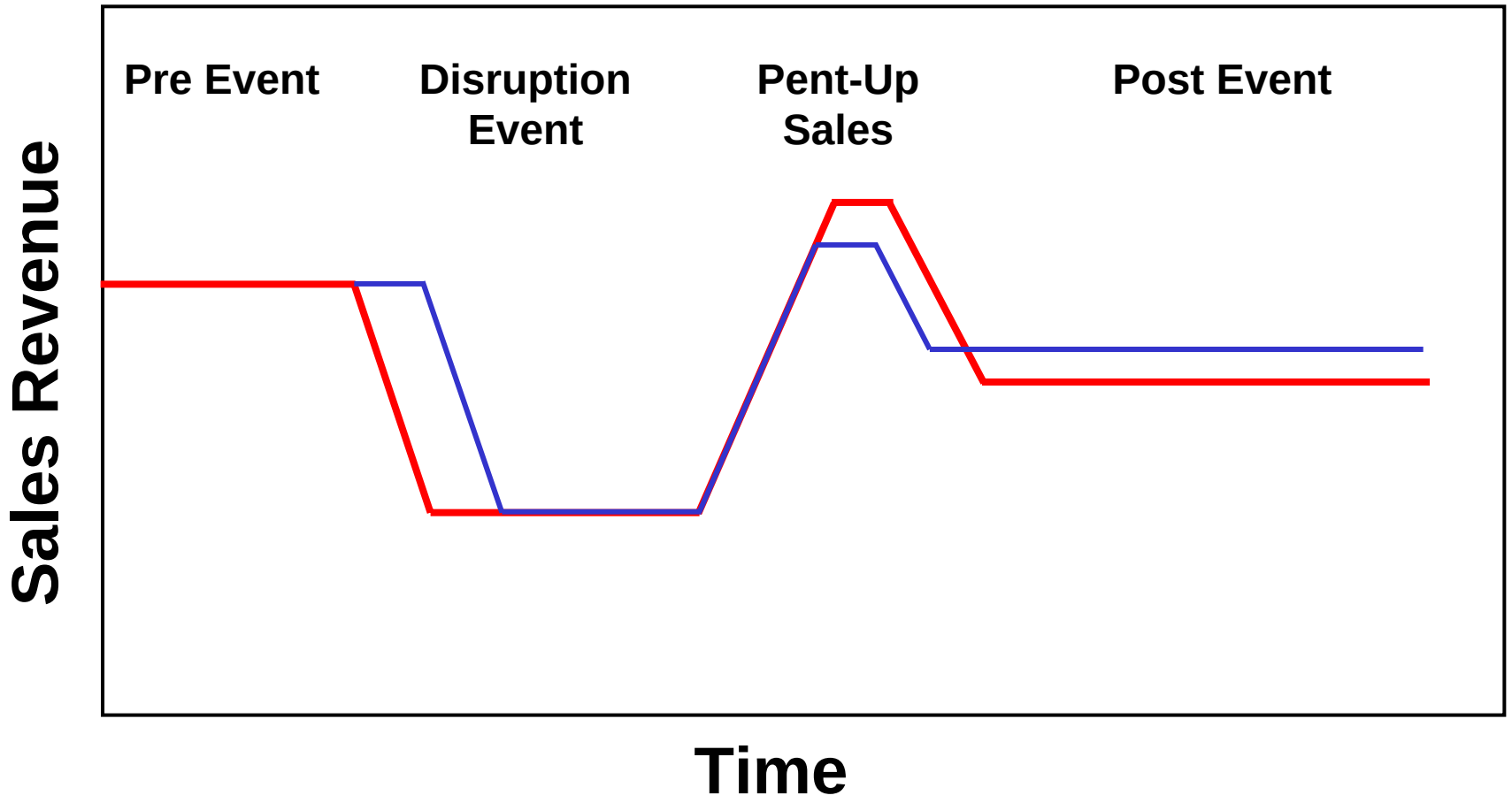
Supply chain disruptions can have both tactical and strategic consequences



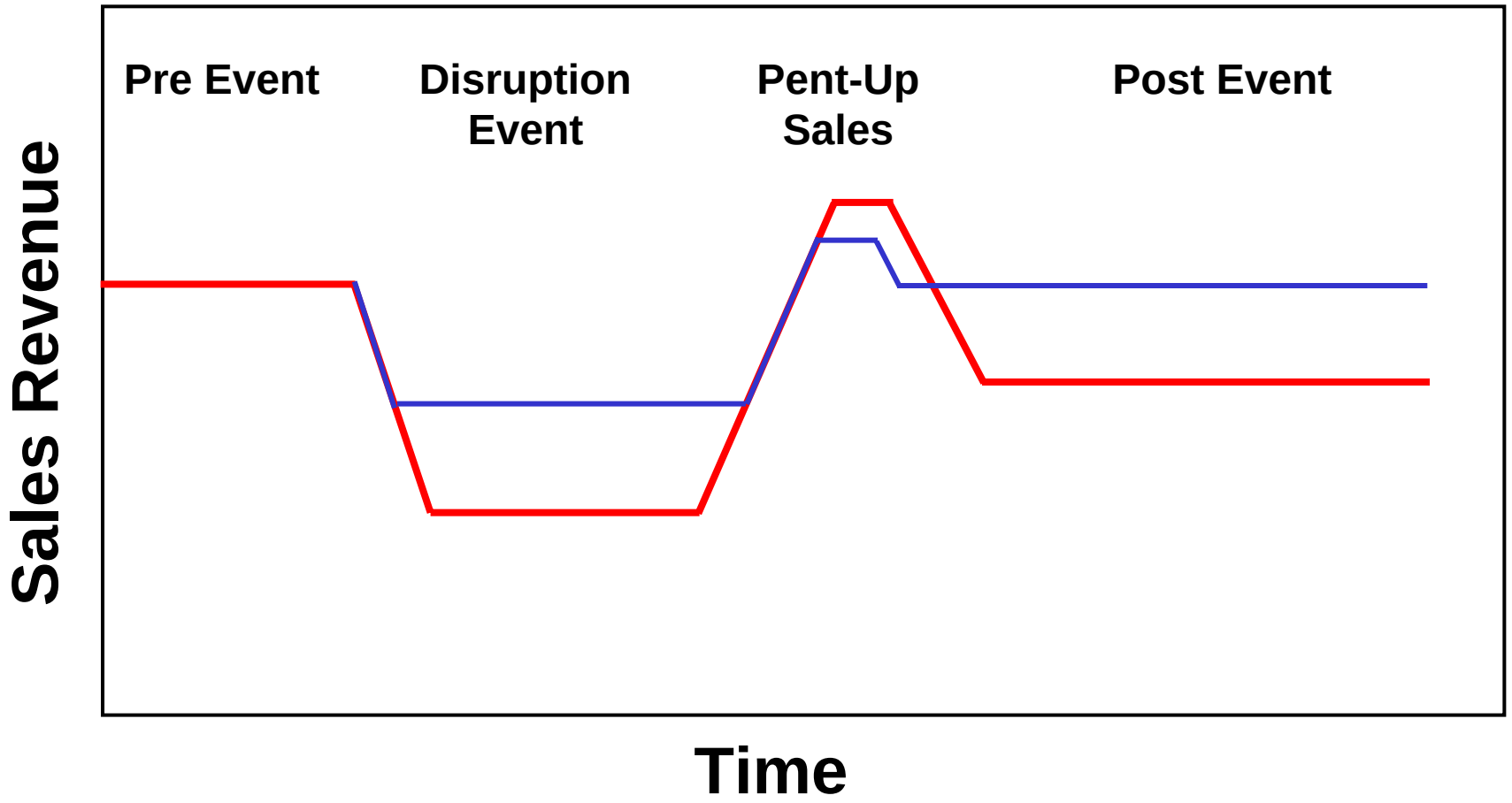
Impact of a supply chain disruption on sales revenue



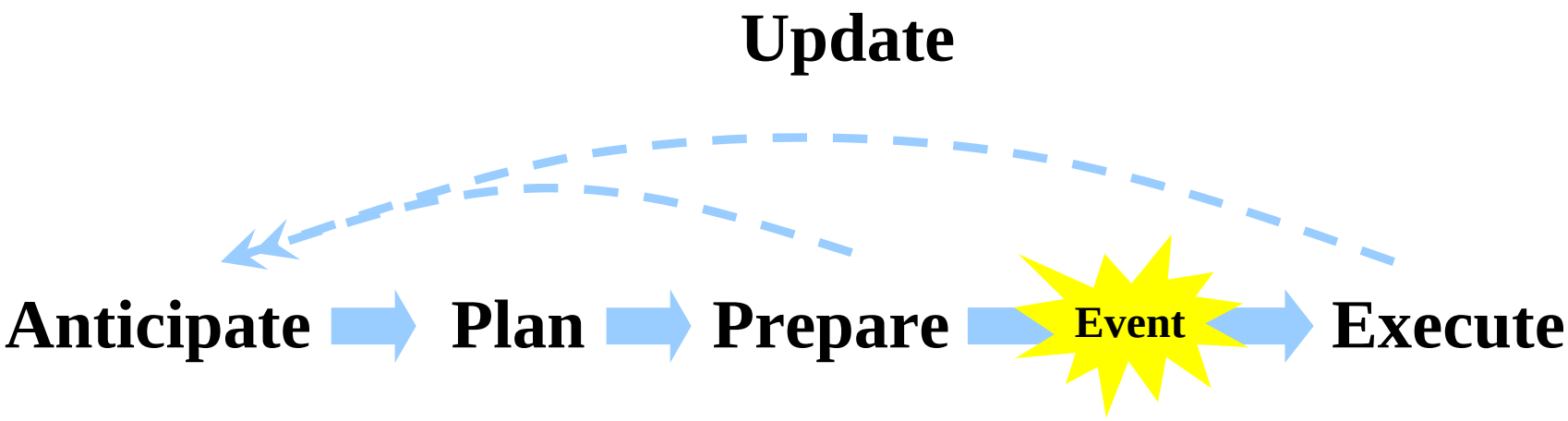
Impact of maintaining an inventory buffer



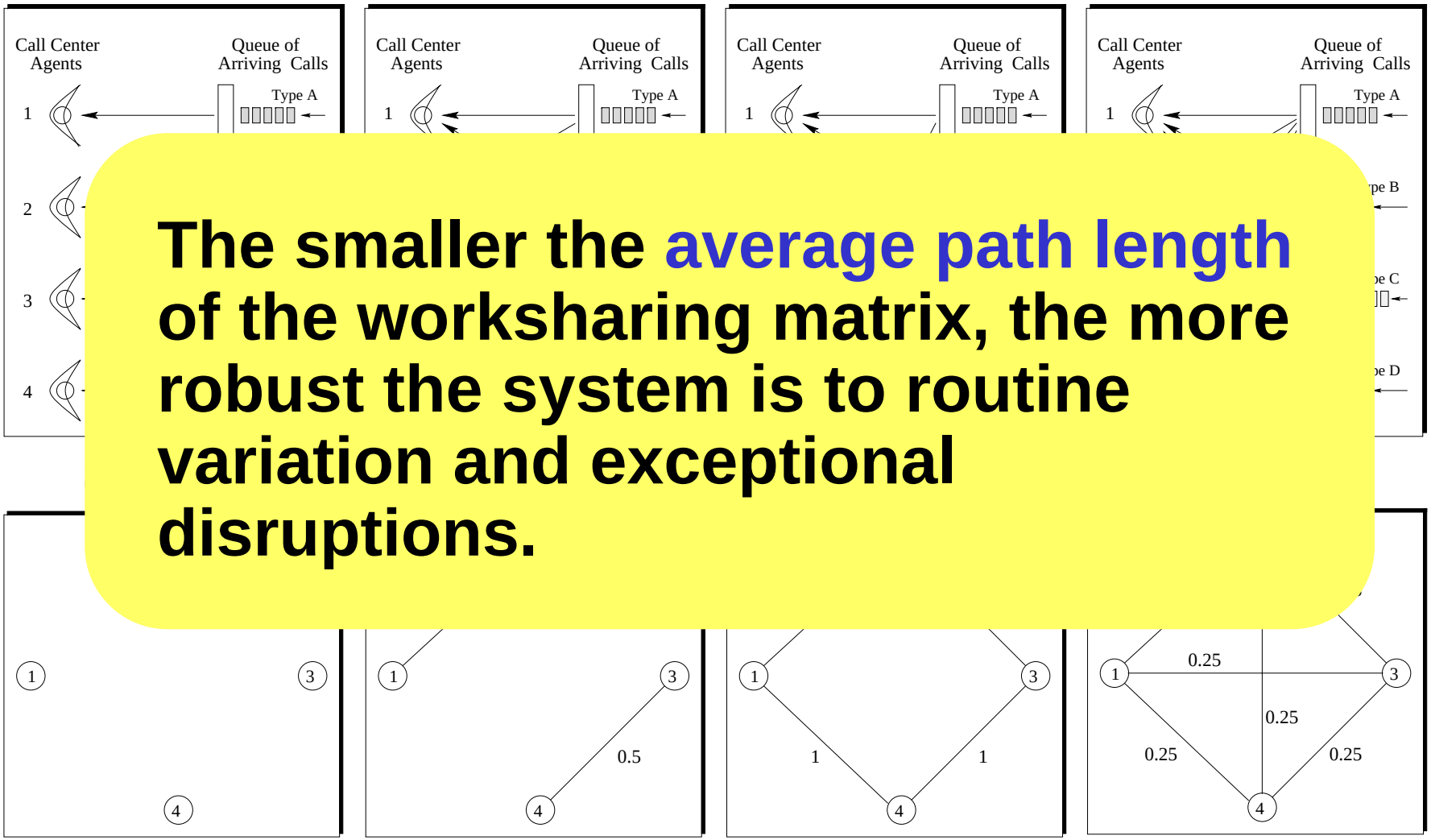
Impact of securing a backup capacity supply



Contingency Planning is one way to prepare for risky events



We can use network theory to measure **structural flexibility** in organizations



The smaller the average path length of the worksharing matrix, the more robust the system is to routine variation and exceptional disruptions.

Globalization, connectivity and complexity are posing serious new security threats

Factory Physics and Network Science are useful tools in the emerging field of Security Engineering

Thank you on behalf of the OPEM Research Group!

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