
A Supply Network Resiliency Assessment Framework

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MIT Roundtable on Quantifying Resiliency

Oct 28, 2015

Agenda

Background

- Our approach
- Results & Insights

Resiliency previously was largely based on gut-feel and intuition – our approach quantifies resilience and mitigation

	Problems with resiliency today	Our approach
Assessing Resilience	<ul style="list-style-type: none">• Lacks formal process to assess and evaluate supply chain resiliency	<ul style="list-style-type: none">• Quantify the assessment of resiliency in supply chain
Mitigation	<ul style="list-style-type: none">• Unclear where to spend mitigation dollars and how much	<ul style="list-style-type: none">• Quantify the value of mitigation options

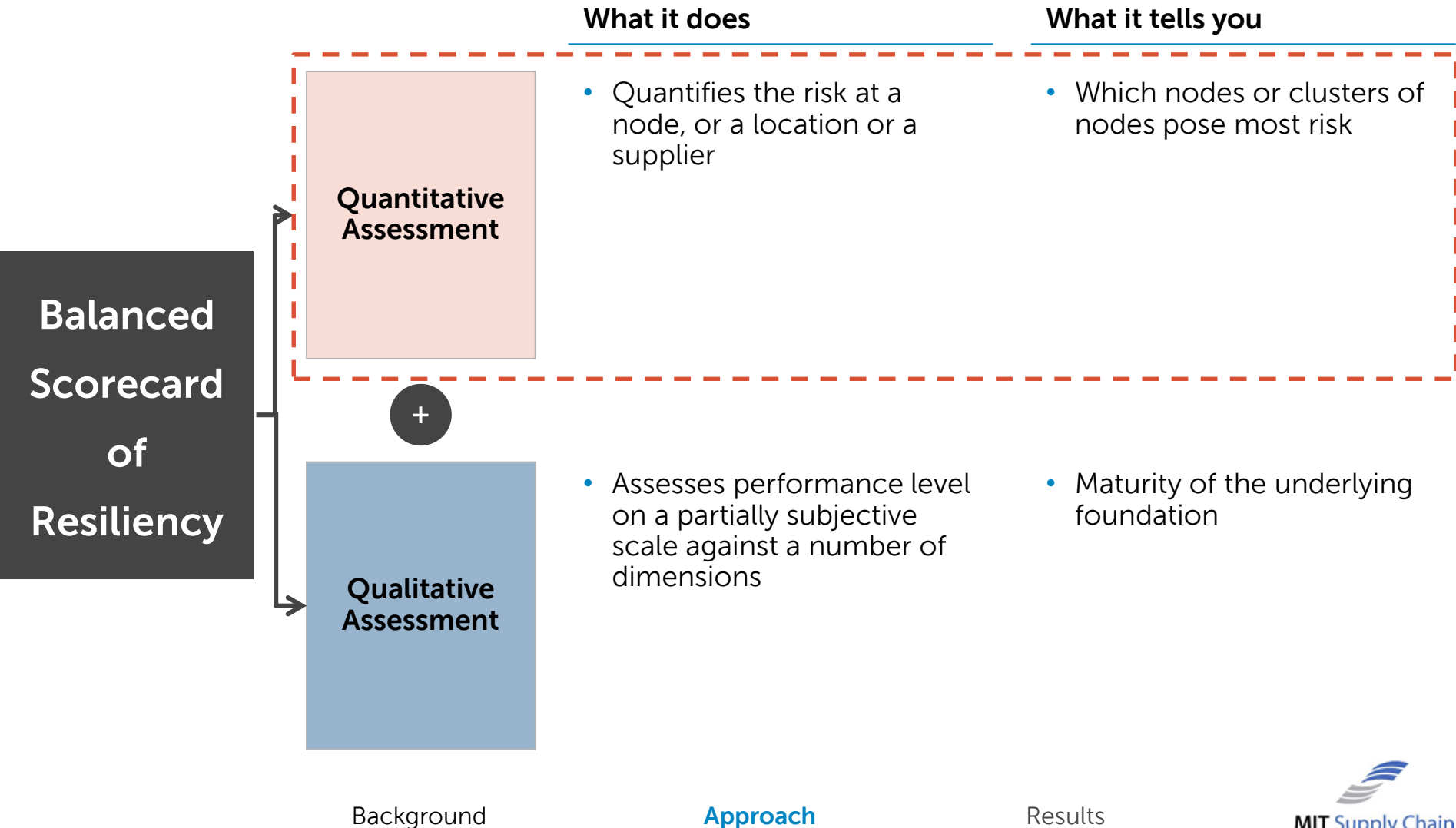
Agenda

- Background

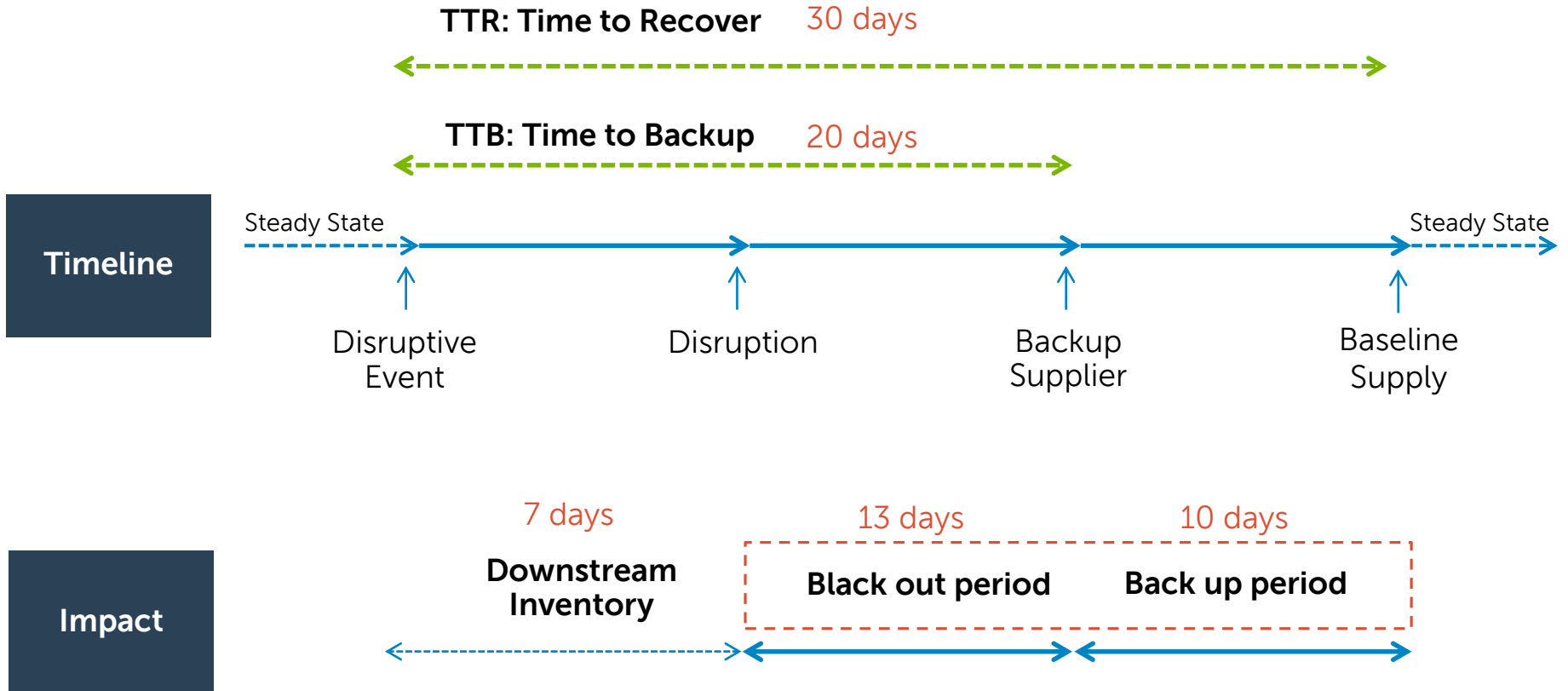
Our approach

- Results & Insights

Holistic Assessment of Resiliency

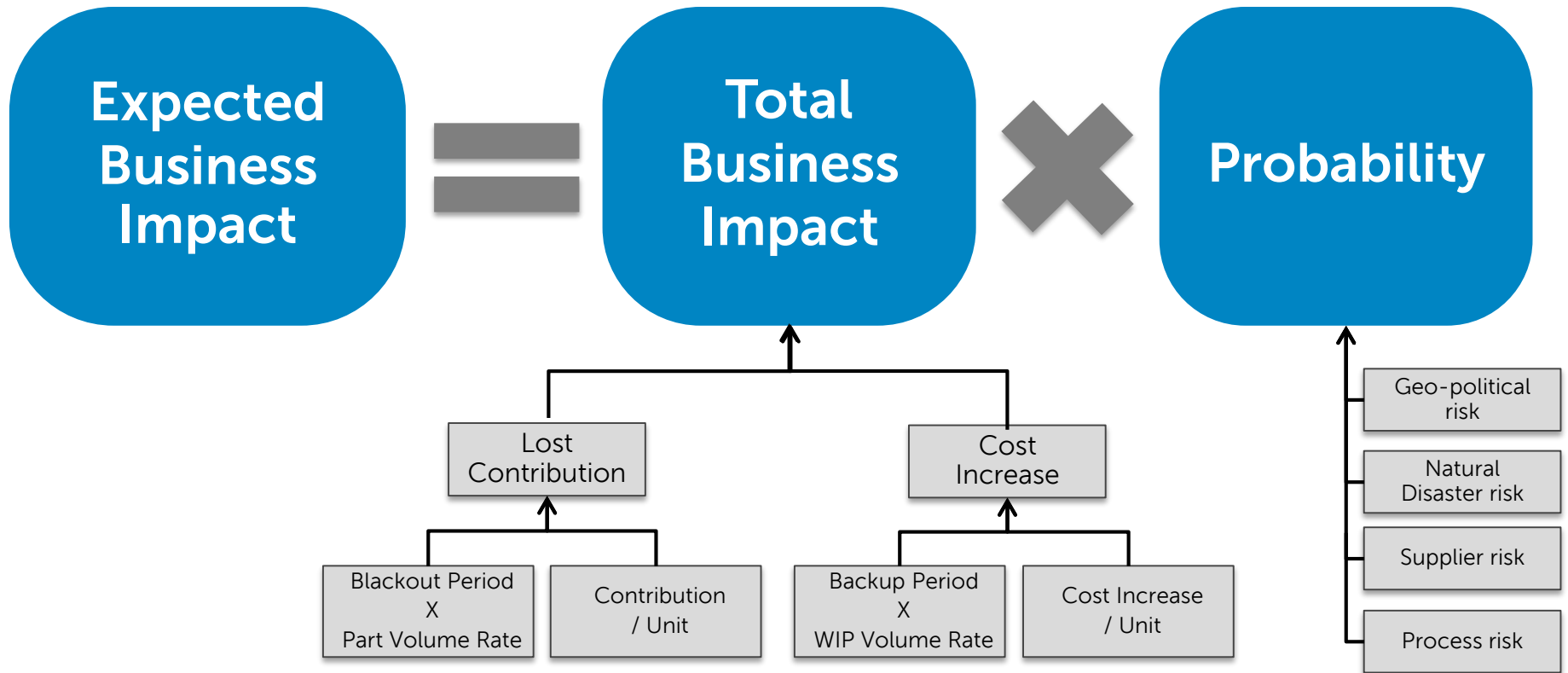


Definitions: Timeline of a Disruptive Event



Business Impact = Lost Sales Contribution + Increased Cost

Explanation: Computing Expected Business Impact

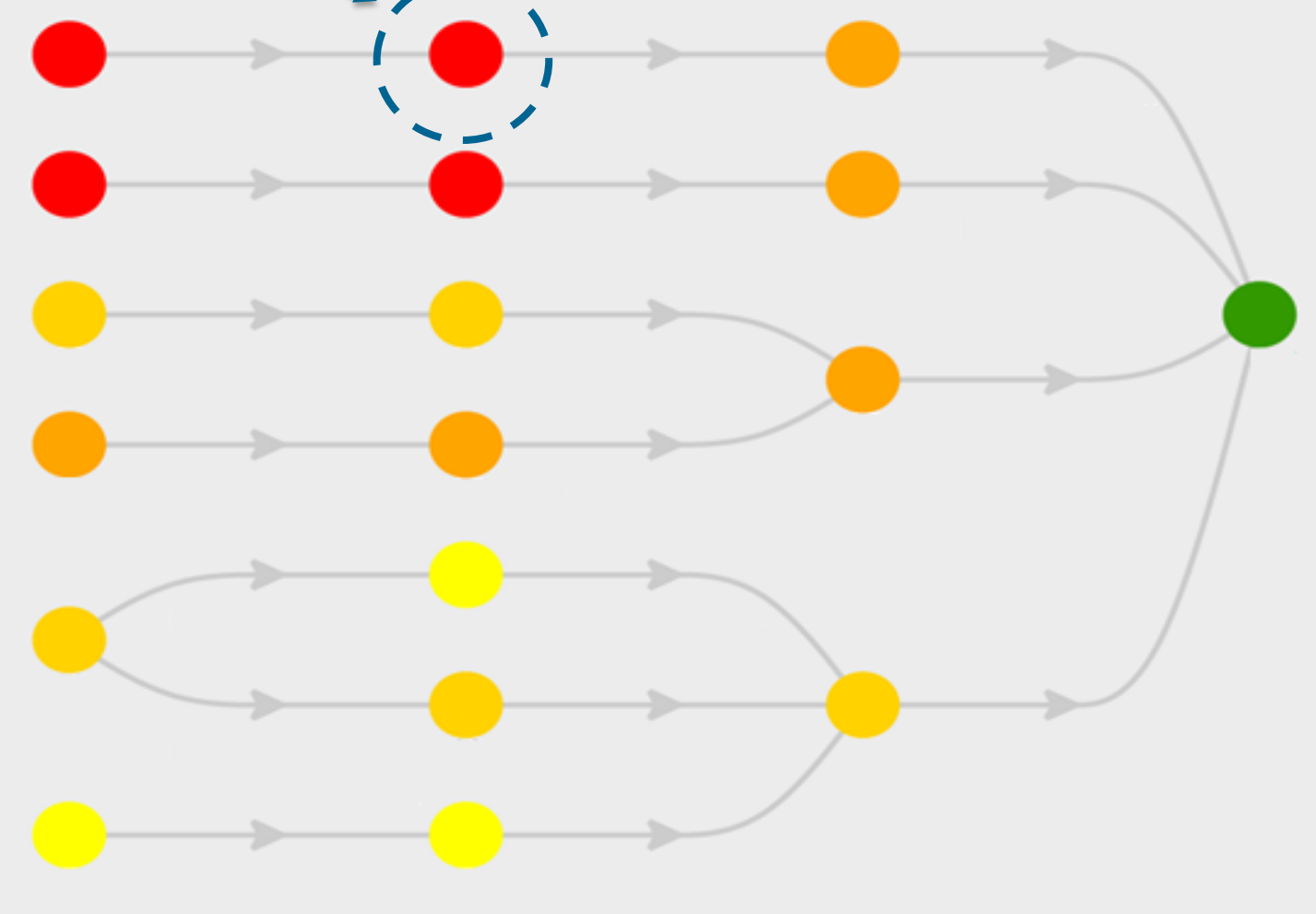


Background

Approach

Results

Example: Expected Business Impact at a Node



Example: Expected Business Impact at a Node

Disruptive Events	Time to Recover	Probability of Disruption	Exp. Contribution at Risk	Exp. Cost to Recover	Exp. Business Impact
Minor Events	20	40%	\$1,000	\$500	\$1,500
Major Events	60	5%	\$500	\$250	\$750
TOTAL			\$1,500	\$750	\$2,250

Minor

Description

- Relatively low impact
- Medium or high probability events

Example

- Process failures
- Minor quality issues

Major

- High impact
- Low probability events

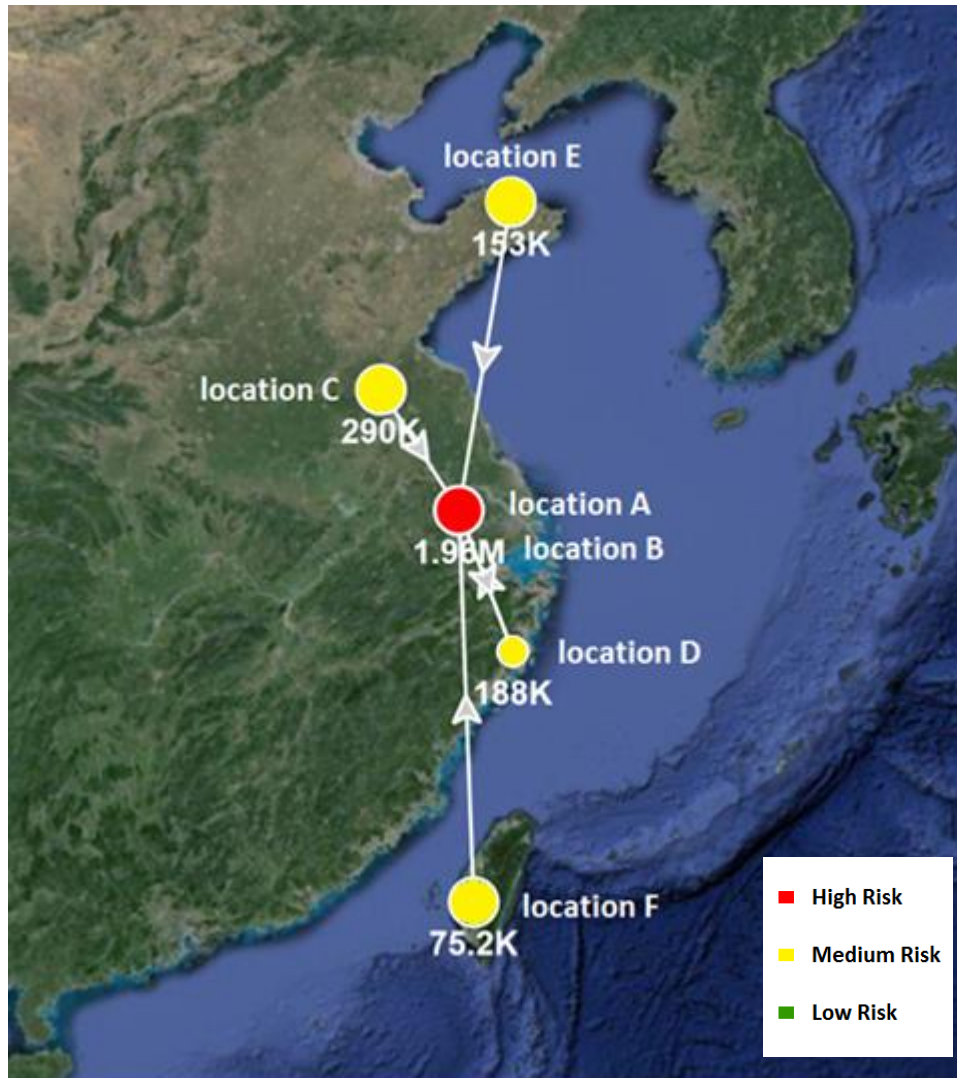
- Earthquakes
- Vendor bankruptcy

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Results & Insights

Map view of Results: Expected Business Impact Risk



• **Sourcemap** enables supply chain **visualization** for:

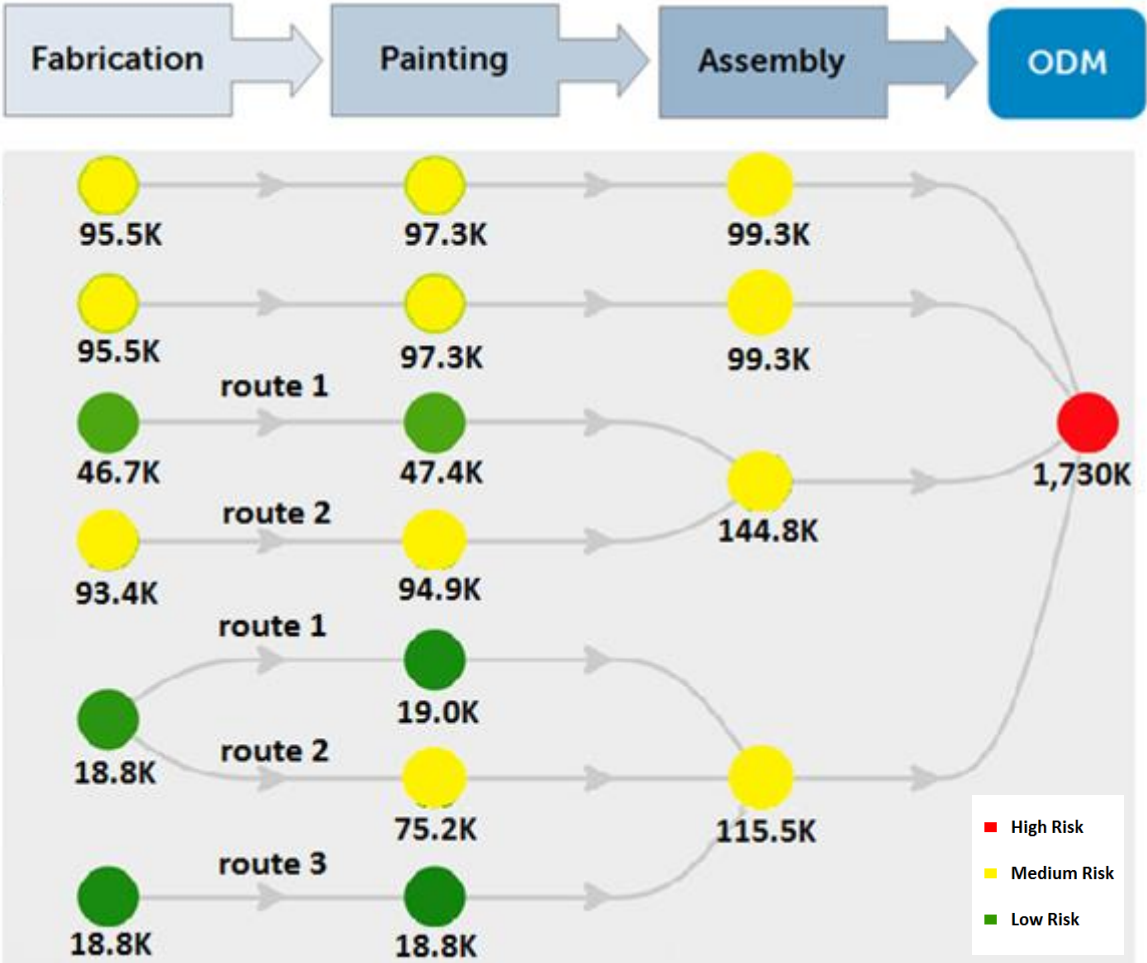
- Node locations
- Directional flow of material
- Business impact metric
 - Color-coded

Background

Approach

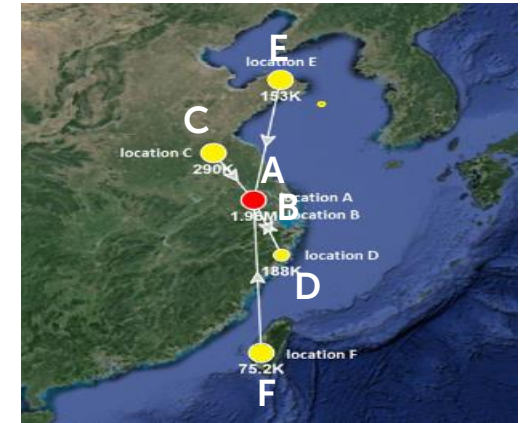
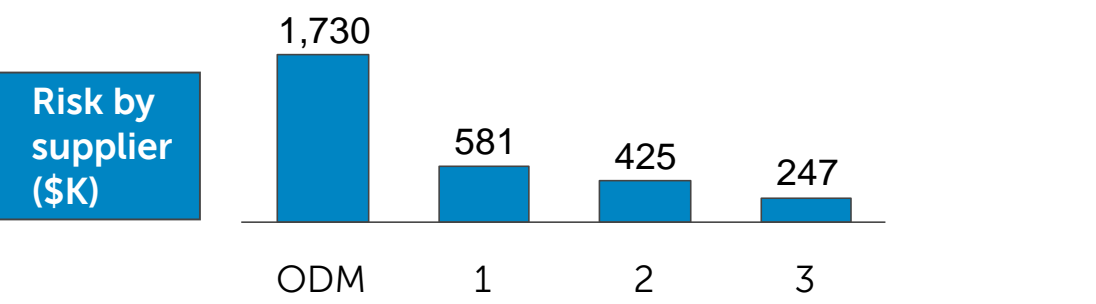
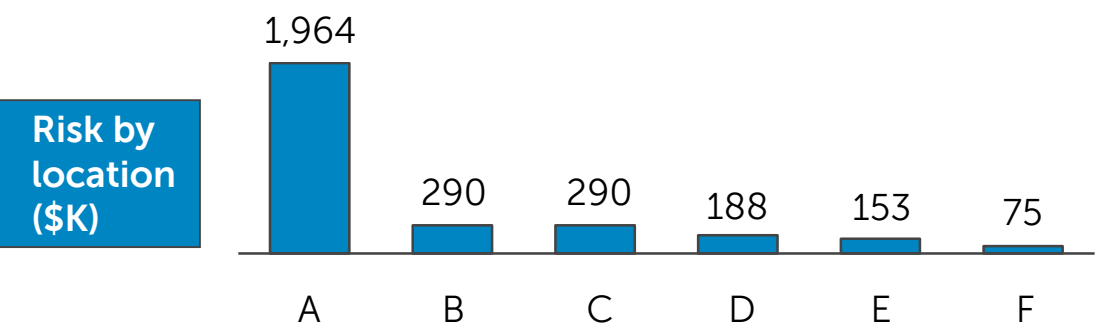
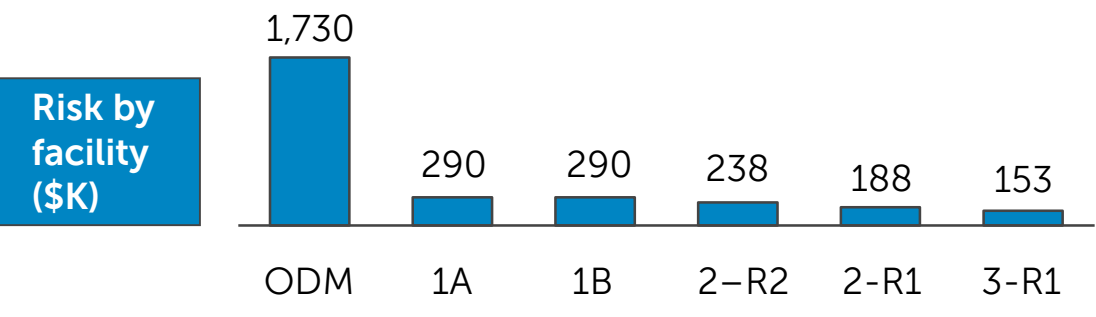
Results

SC Network view of Results: Expected Business Impact Risk



- SC Network Visualization allows us to see:
- ODM ~ 1.73M exp. BI
- Supplier 1 highest exp. BI
- Assembly process highest exp. BI

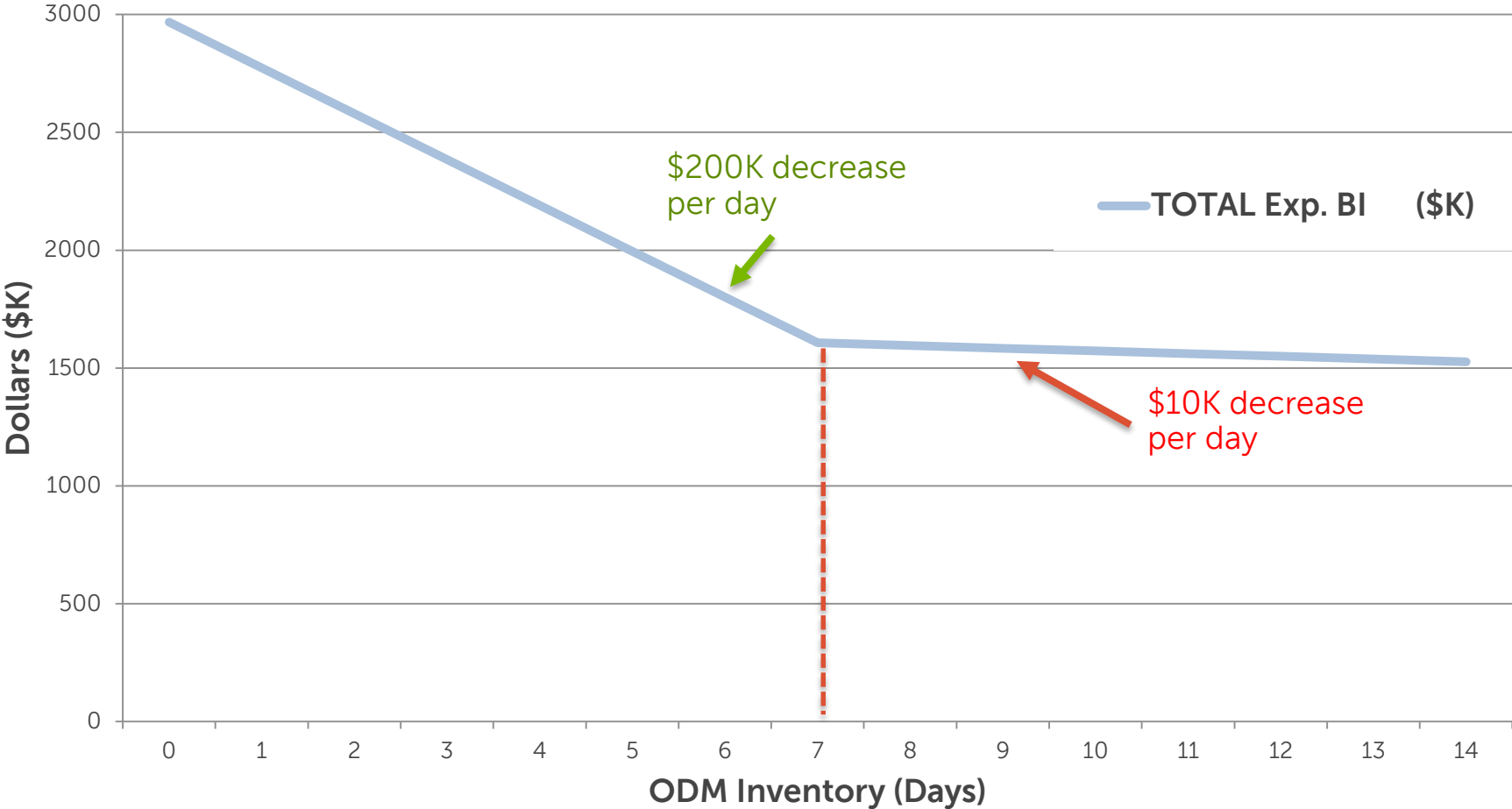
Comparing Results: Identify and Prioritize Risky Locations and Suppliers



- **Identifying Critical Entities:**
 - Supplier 1
 - Location A
- **Supplier 1:** ~ \$600k due to 2 facilities
- **Location A:** ~ \$2M due to concentration of suppliers

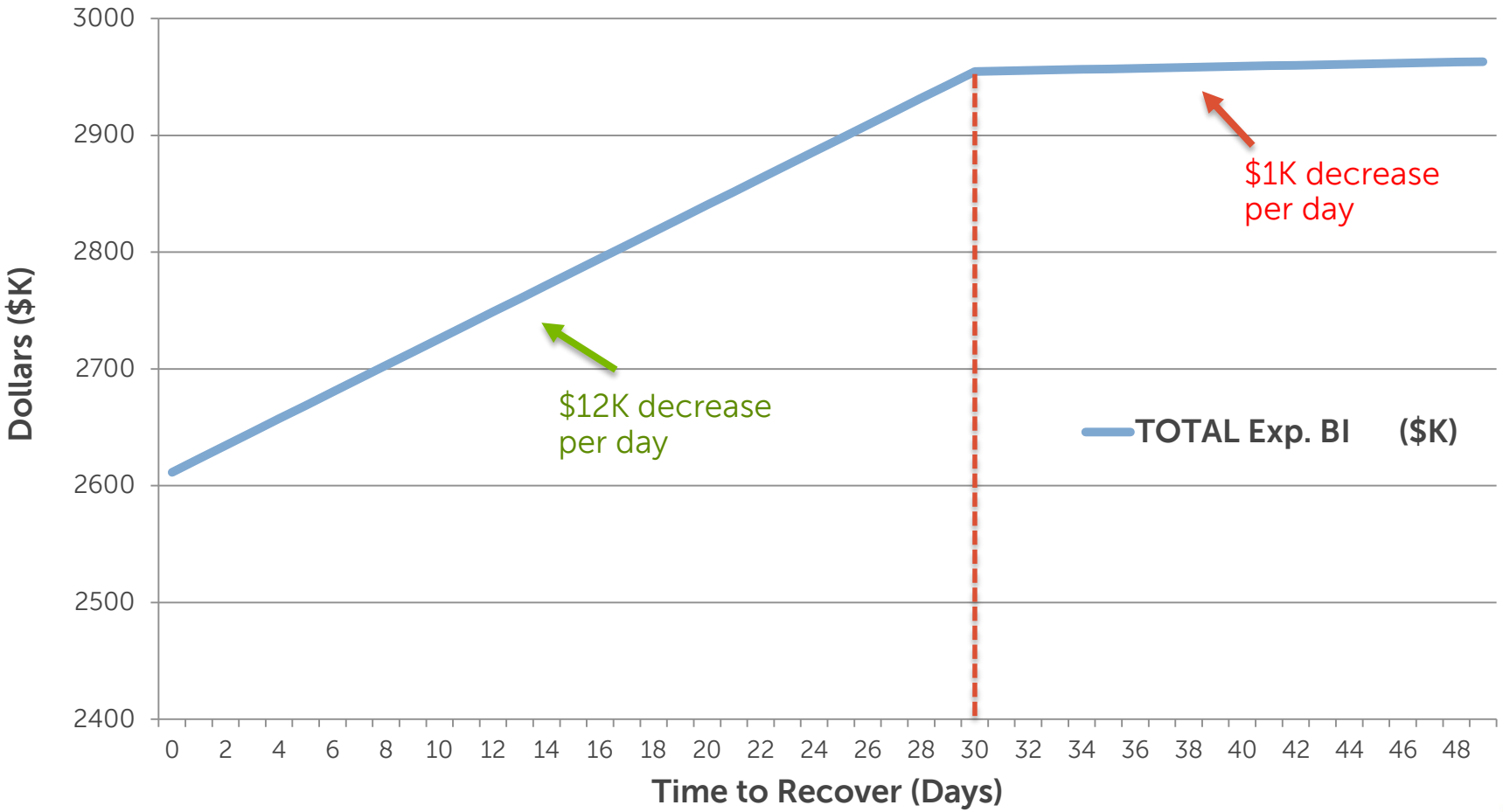
Sensitivity of Results: Quantifying Value of Mitigation Options

Expected Business Impact vs. ODM Inventory



Sensitivity of Results: Quantifying Value of Mitigation Options

Expected Business Impact vs. Time to Recover (TTR)



Insights

1. **Tension** is present between *efficiency* and *risk*.
2. **Visualizing** supply chain risk helps managers understand geographic location risk. Risk aggregates when same suppliers or locations occur multiple times.
3. **Risk** depends on Time-To-Recovery (TTR), Time-To-Backup (TTB), downstream inventory, supply chain structure, and volume of flow.
4. **Choice of mitigation option**, and extent of investment depends on marginal benefit of option vs. additional cost (illustrated from *response curves*).