# SCRM--Supply Chain Risk Management:

## *"Designing & Planning for Resiliency"*


**Gregory L. Schlegel CPIM, CSP, Jonah**
Founder, The Supply Chain Risk Management Consortium
Executive in Residence, Adjunct Professor , Supply Chain Risk Management,
Lehigh Graduate Program
Adjunct Professor, ERM, Villanova Graduate Program
grs209@lehigh.edu
http://lehigh.bizvision.com/page/scm
973-615-2050
September 17, 2014

SherTrack
Demand-Driven Predictive Manufacturing

SUPPLY CHAIN RISK MANAGEMENT CONSORTIUM™

LEHIGH UNIVERSITY

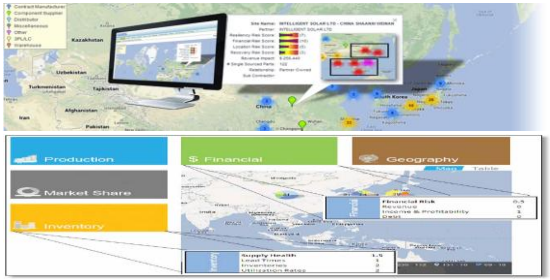
# Emerging SCRM Planning Threads

- The FOUR Spheres of Supply Chain Risk
- Network Supply Chain Mapping/Risk Assessment
- Probabilistic Planning
- Supply Chain Maturity & Process Improvement
- Network Supply Chain Alerts in the S&OP Process


SUPPLY CHAIN RISK MANAGEMENT CONSORTIUM™

# The Four Spheres of Supply Chain Risk

## New **Supplier** Rating Tools Emerging

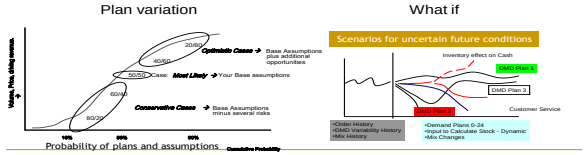



SUPPLY CHAIN RISK MANAGEMENT CONSORTIUM™

## **DEMAND MANAGEMENT**---Defining How to Bring Scenario Planning to an Actionable Level

Application: clarity on how to apply and the level of planning capability needed to support.
Define as future "what if," not variations on plans

Control plan: how to maintain scenario integrity, ensure they are executable, and there is a continuous improvement process.




SUPPLY CHAIN RISK MANAGEMENT CONSORTIUM™

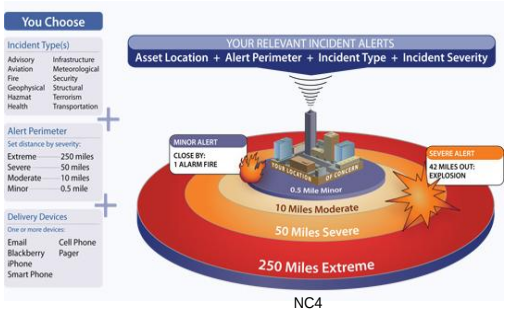
SUPPLY

DEMAND

PROCESS

TAL

## Worldwide Strategic & Tactical Risk Event Alerts

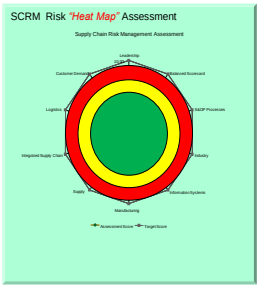



NC4

SUPPLY CHAIN RISK MANAGEMENT CONSORTIUM™

## Supply Chain Risk Assessment– *"Heat Map"*

**INTERNAL PROCESS ANALYSIS**

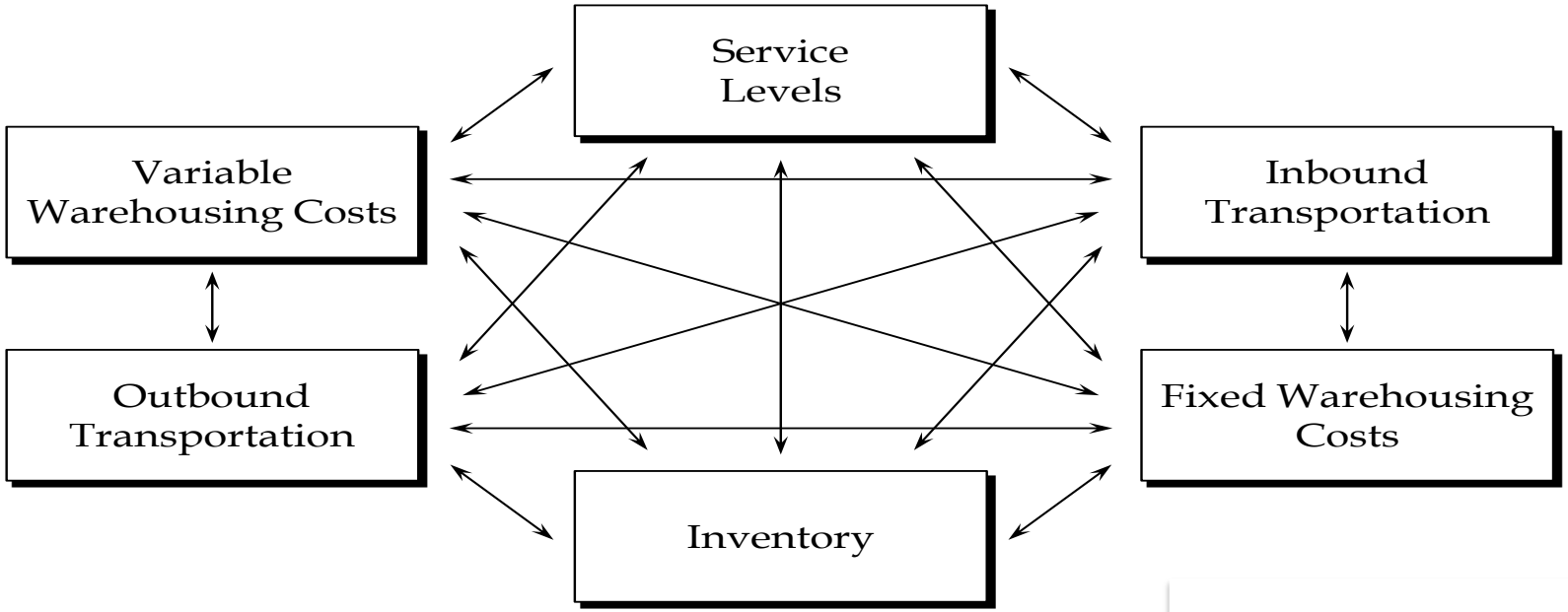



SUPPLY CHAIN RISK MANAGEMENT CONSORTIUM™

# The Consortium Advocates Supply Chain Mapping….*Gather Data*

***Our Perspective - Designing Distribution Networks***

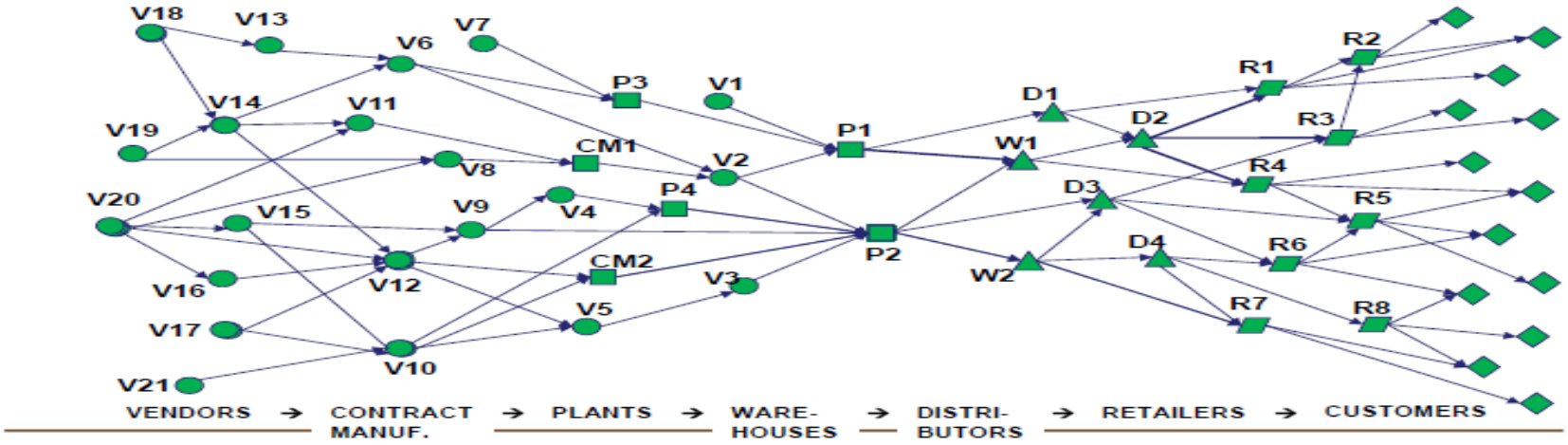
**Designing the distribution network will require tremendous discipline, analytical skill, business sense, and creativity to master the various tradeoffs that need to be considered.**



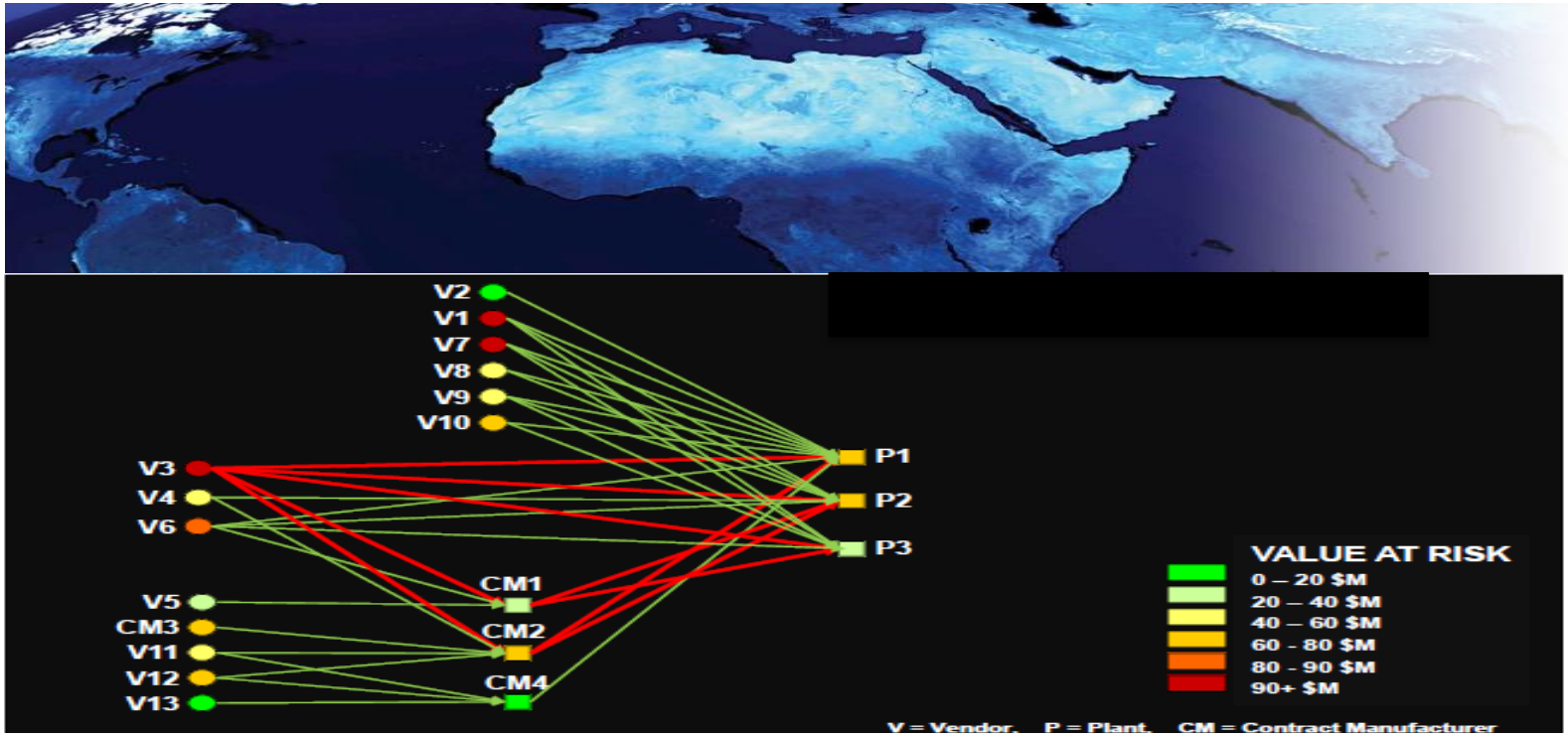
# Then, *Build Out a Supply Chain Map….*

## Create the strategic network display

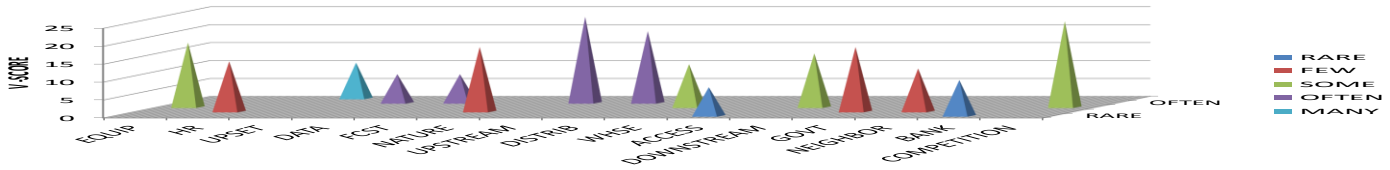
CORPORATE DATABASES → *extract* → 1. BOM Data 2. Part Supplier Data 3. Supplier Location Data → *create* → Strategic Network Display (SND)



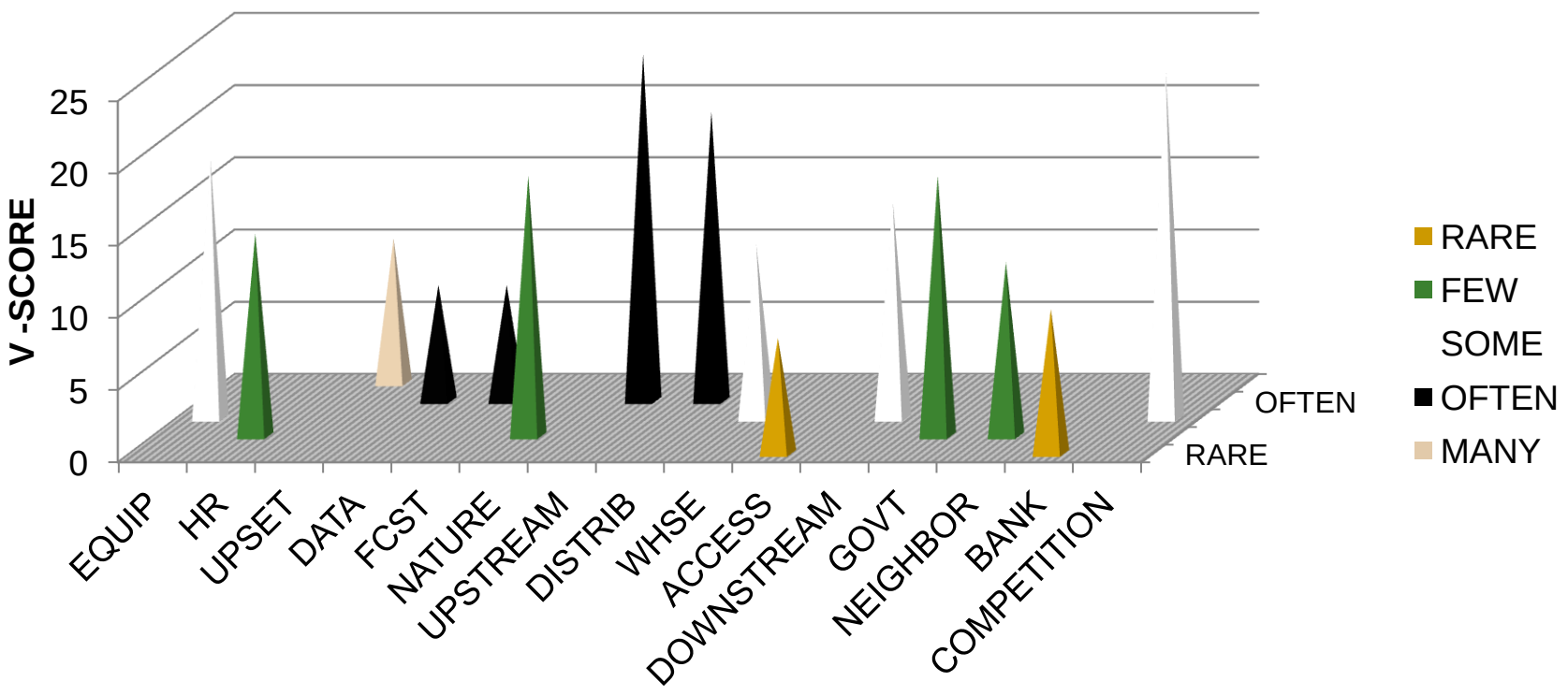
# And Superimpose Risk Across the Chain, Node by Node




Node Vulnerability Landscape



# Node Vulnerability Drivers Landscape



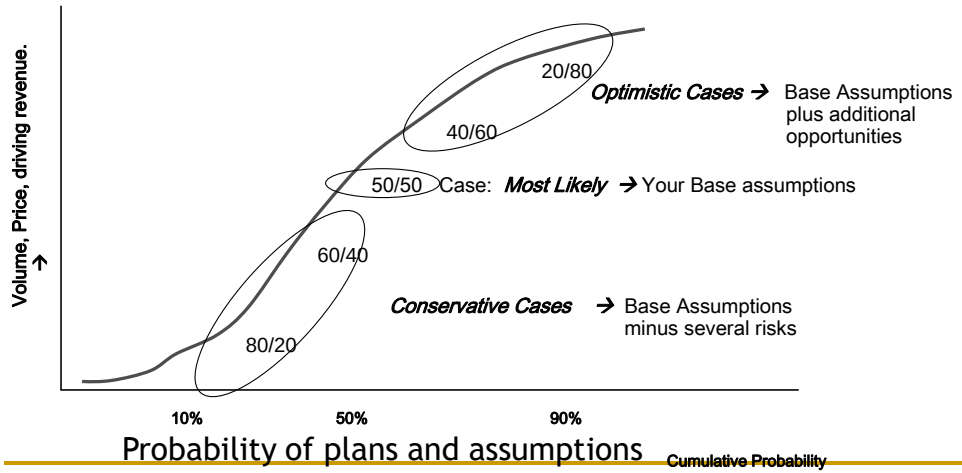
# **DEMAND MANAGEMENT**---Defining How to Bring ***Scenario Planning*** to an Actionable Level

Application: clarity on how to apply and the level of planning capability needed to support.

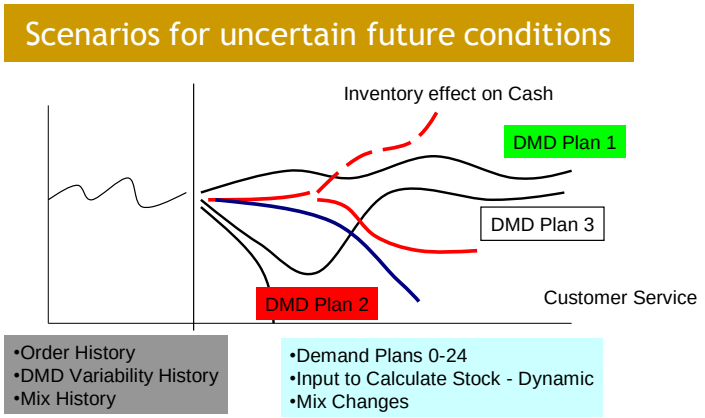
Define as future "what if," not variations on plans

Control plan: how to maintain scenario integrity, ensure they are executable, and there is a continuous improvement process.

Plan variation




What if



# APICS Dictionary Definition: Stochastic & Probabilistic Modeling

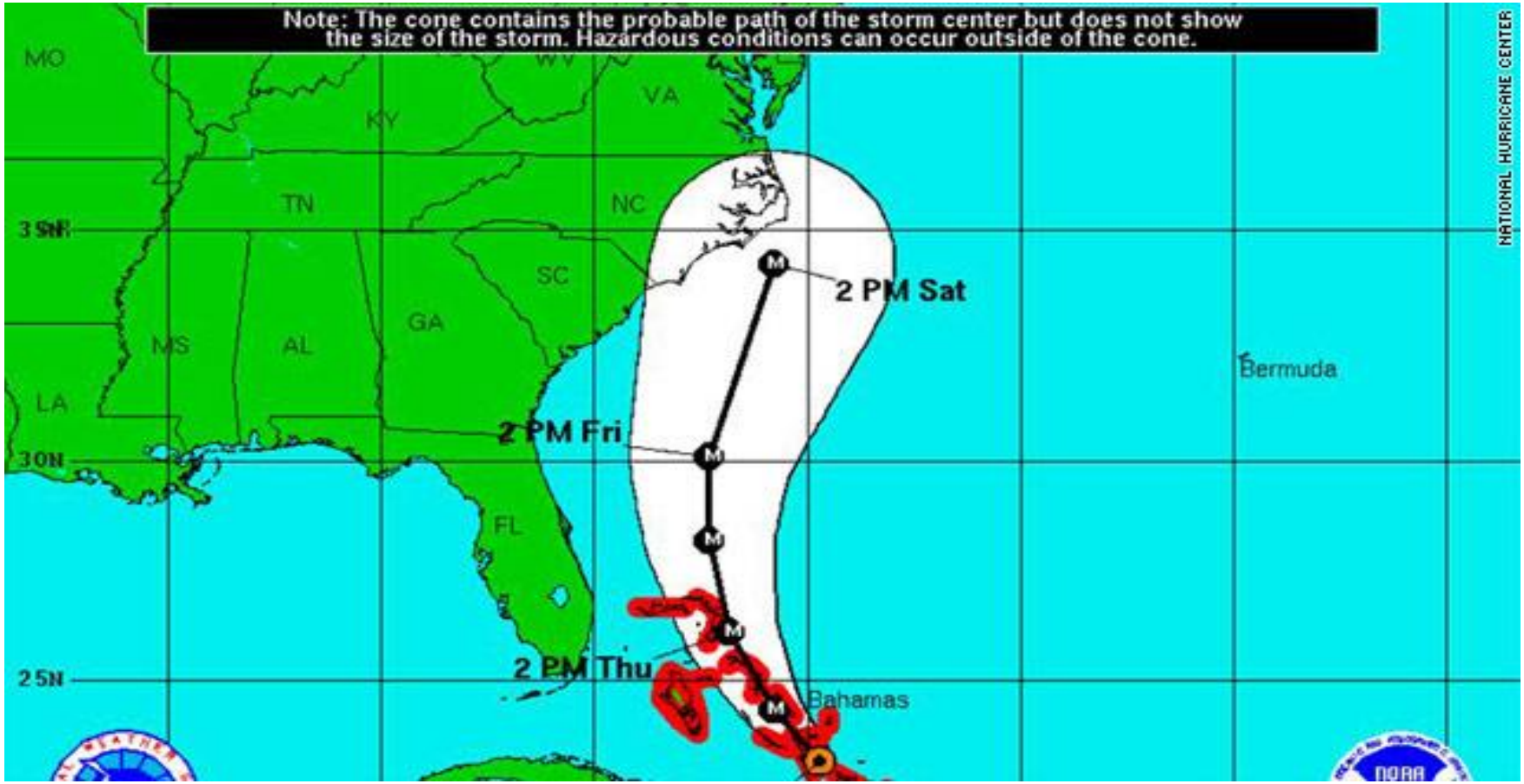
- **Stochastic models**:
  - *Models where uncertainty is explicitly considered in the analysis*
- **Probabilistic demand models:**
  - Statistical procedures that *represent the uncertainty of demand* by a set of possible outcomes (*i.e., a probability distribution*) and that suggest inventory management strategies under probabilistic demands

# The New Probabilistic Modeling Approach

Now emerging in supply chain and operations management

# The New Face of Probabilistic Risk Mgmt

***"The cone of uncertainty"***



# NEXT GEN Scenario Planning

Supply chain Flow model

Base case data

Decision Logic

Probability Distributions of uncertain factors

Probability of occurrence & magnitude of disturbing events

Design of Experiments

Probabilistic Simulation

Scenario Outcomes/Dashboards


sixsigma

LEHIGH UNIVERSITY

CVCR

Performance Measures

Feasible Tactical Plans

No

Strong Statistics?

Yes

Prioritized Scenarios

Risk Response Plan

# ***Predictability & Resiliency------***

# Scenario/Risk Response Planning

Scenario Probabilities of Occurrence

HIGH

Scenario 1…..

LOW

Risk Associated with Occurrence

LOW

**Occurrence**

*****

**Severity**

*****

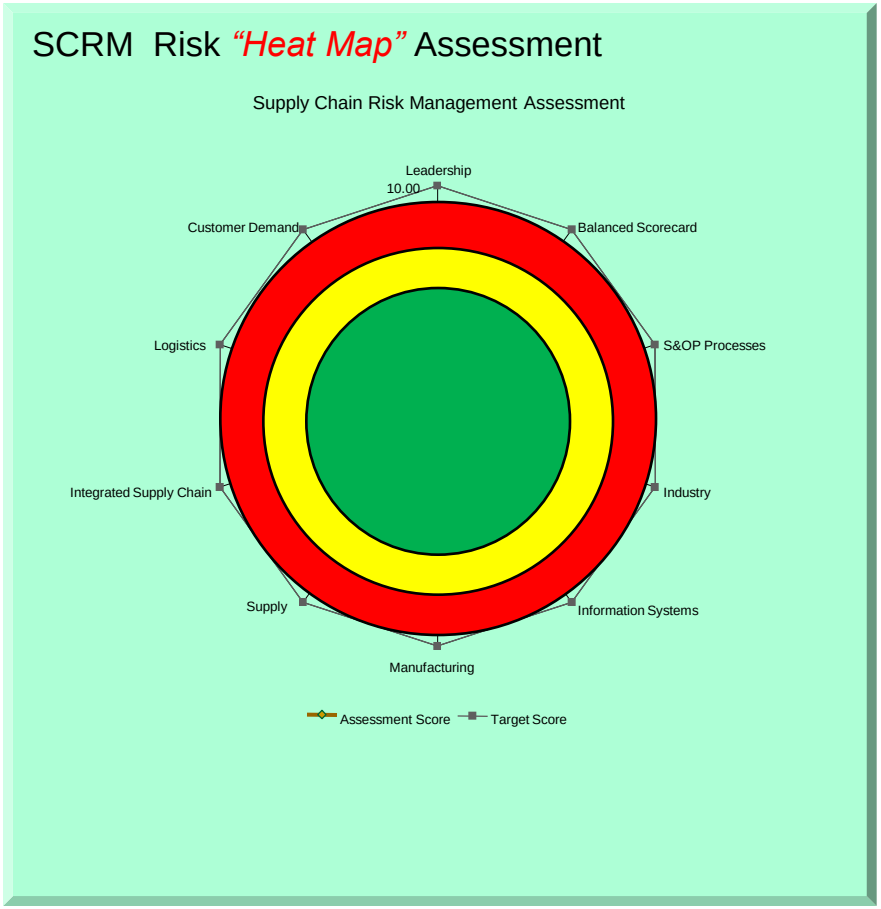
**Detection (FMEA)**

HIGH

Risk Response Plan

# Supply Chain Risk Assessment– *"Heat Map"*

**INTERNAL PROCESS ANALYSIS**



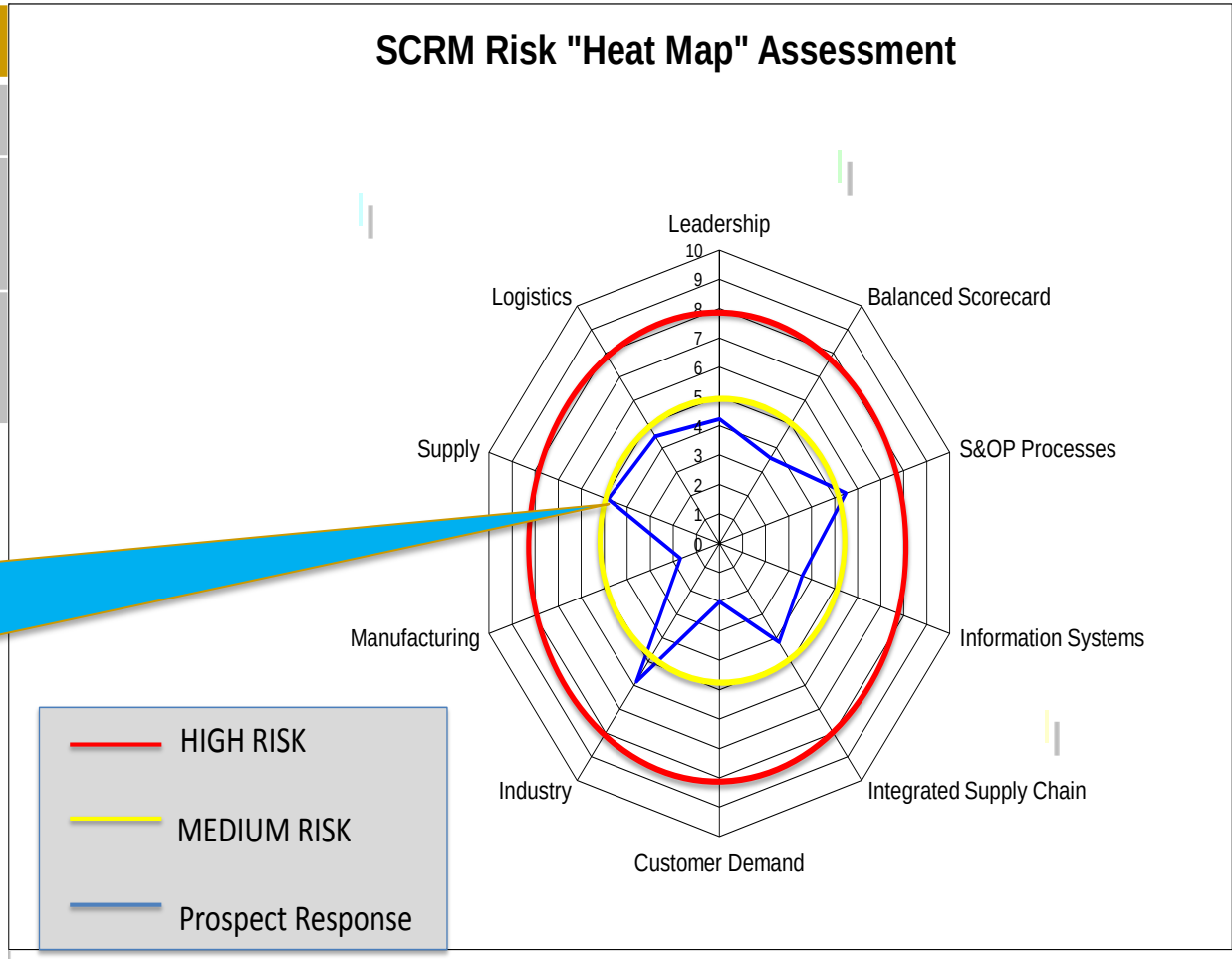
# Heat Map Tool Rating Example

| [ChemCo] | Valuation Factors | | | Average Raw Score | Valuation Rating |
|---|---|---|---|---|---|
| | 10-to-8 | 7-to-5 | 4-to-1 | | |
| Supplier Proximity | Critical suppliers are on other continents | Critical suppliers are in-country | Critical suppliers are next door | 6 | 6 |
| Supplier Co-Location | Critical suppliers are all in same geographic area | Some critical suppliers grouped, others dispersed | All critical suppliers are intentionally dispersed, or backups are dispersed | 7 | 7 |
| Diversity of Modes | Highly reliant on single transport mode for some critical supply chains, no realistic alternative | Some limited ability to switch transport modes in emergency situations | Mode diversity designed into critical supply chains and periodically exercised | 5 | 5 |
| Supplier Diversity | Highly reliant on a few critical suppliers, no backups in place | Some concentrated supply positions, with some backups in place | Intentional diversity of supply with backups and/or alternative inputs in place and periodically tested | 6 | 6 |

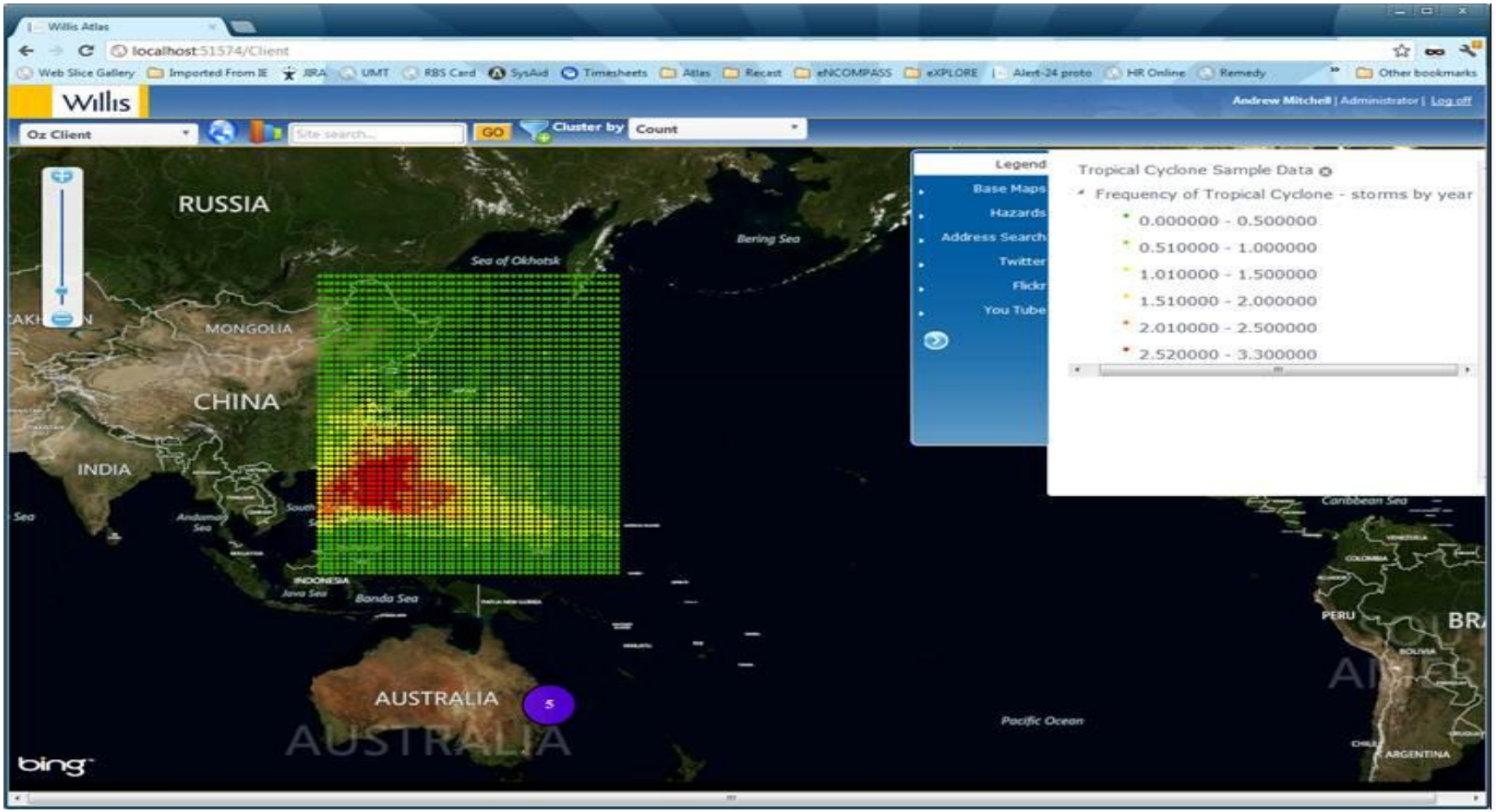
# The SCRM "Heat Map" Assessment……

| | RISK | GRADIENT |
|---|---|---|
| | Low Risk | 1-to-4 |
| | Medium Risk | 5-to-7 |
| | High Risk | 8-to-10 |

Oil & Gas Risk Seminar Response



# Environmental Threats…..



# Worldwide Strategic & Tactical Risk Event Alerts


NC4

# SCRM--Supply Chain Risk Management:

## *"Designing & Planning for Resiliency"*


**Gregory L. Schlegel CPIM, CSP, Jonah**
Founder, The Supply Chain Risk Management Consortium
Executive in Residence, Adjunct Professor , Supply Chain Risk Management,
Lehigh Graduate Program
Adjunct Professor, ERM, Villanova Graduate Program
grs209@lehigh.edu
http://lehigh.bizvision.com/page/scm
973-615-2050
September 17, 2014

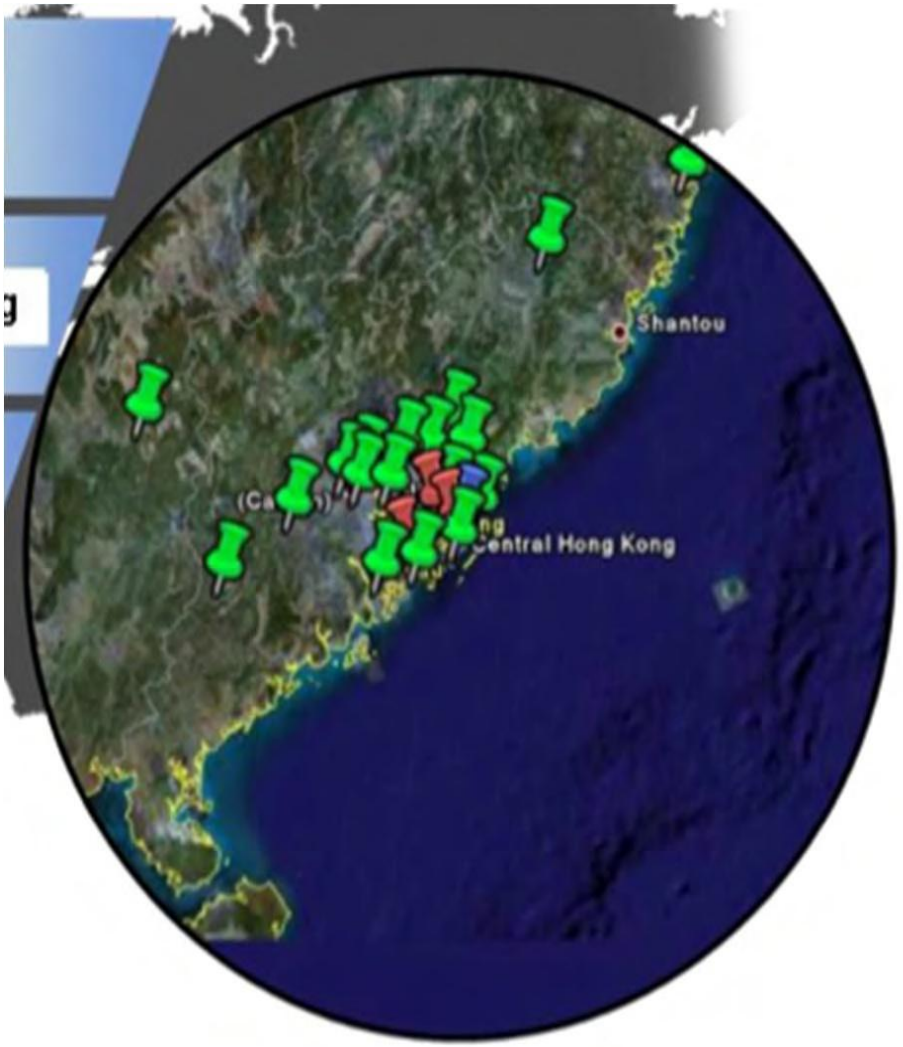
SherTrack
Demand-Driven Predictive Manufacturing

SUPPLY CHAIN RISK MANAGEMENT CONSORTIUM™

LEHIGH UNIVERSITY

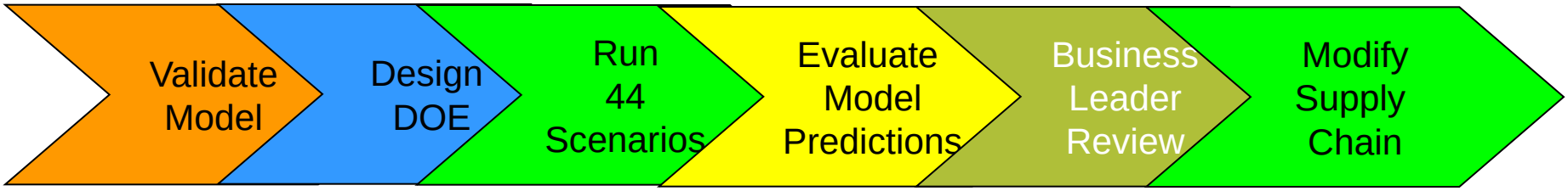
# Cisco's Story about SC Mapping….

- Chengdu, China earthquake event, magnitude 7.9: May 12, 2008
- Within 48 hours, Cisco was able to conduct a full impact analysis, which included evaluating affected supplier sites, parts, and products
- Within **two** days of the earthquake, SCRM group initiated a crisis survey targeted at the suppliers' emergency contacts
- Assessments after 24 hours of event revealed Cisco had 20 suppliers in the affected area
- Two suppliers were at risk: supplier X, which represented a significant revenue risk/single-sourced, and Supplier Y, smaller revenue risk but damage to its buildings
- Supplier X was already under review and Cisco had a second source
- With Supplier Y, Cisco's crisis management team was deployed to assist the supplier mitigate any production delays and the risk was minimized



# This New Methodology Leveraged at Bayer

- Combining Predictive Analytics and Risk Management with Digital Modeling leveraged the power of three methods.
- Bayer utilized innovative predictive manufacturing technology ***to support Scenario Planning***
- A cross-functional team, in collaboration with SherTrack, configured a ***digital model to simulate customer demand, scheduling and production output of a very complex compounding facility***
  - *Could reduce lead times by 45% without service issues*
  - *Could gain planned market share by lead time reduction/no capacity issues*
  - *Could improve capacity throughput without capital equip*
  - *Could reduce inventory by over 25% AND reduce production costs as well*



# Flextronics' SCRM-- *Visibility & Control* …

- VISIBILITY,
  - ***"Visibility refers to the ability of all members of a chain to see from one end of the pipeline to another***."
  - Lack of SC visibility forces supply chain members to rely on forecasts and to build buffers, thus increasing the network risk
  - Unfortunately, most supply chain members to NOT have detailed knowledge of what is happening in the rest of the chain!
- CONTROL
  - ***"Supply chain control refers to the ability to respond to disturbances in appropriate ways."***
  - Problems arise when disturbances are not recognized in time and when there is a time lag for the remedial action to take effect.
  - ***"Almost all supply chain organizations maintain a certain amount of visibility and control, However, successful organizations in the 21st century need to be aware of WHERE there are vulnerabilities in their supply chains that create risk and HOW they can manage/or mitigate risk wherever possible***."

**Caroline Dowling, President-Integrated Network Solutions, Flextronics**

# Flextronics' SCRM *"War Room"*

# Network Vulnerability Matrix

| SKU | Node | DRIV $VI_{1-N}$ | DRIV $VE_{1-N}$ | $\sum V_{DRIV}$ | DAM $VI_{1-N}$ | DAM $VE_{1-N}$ | $\sum V_{DAM}$ | TRAN Mode | GEO | $\sum V$ | FxN | uDep | cDep | Node Risk | Avg SKU Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | A | ← NODE RISK DRIVERS | | | ↔ RISK DAMPENERS → | | | $V_T$ | $V_G$ | $V_A$ | | | | $N_A$ | |
| | B | | | | | | | | | $V_B$ | | | | $N_B$ | |
| | C | | | | | | | | | $V_C$ | | | | $N_C$ | |
| | D | | | | | | | | | $V_D$ | | | | $N_D$ | |
| | | | | | | | | | | | | | | | $R_1$ |
| 2 | A | ← NODE RISK DRIVERS | | | ↔ RISK DAMPENERS → | | | $V_T$ | $V_G$ | $V_A$ | | | | $N_A$ | |
| | | | | | | | | | | | | | | | $R_2$ |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |


Series on Resource Management
Supply Chain Risk Management
An Emerging Discipline
Gregory L. Schlegel
Robert J. Trent
CRC Press
Taylor & Francis Group