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# Supply Chain Risk Managment

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# Current market situation is difficult to manage

## Current Situation

In today‘s Global Economy, the response to Supply Chain Risk is “reactive”

Traditional, “Cost Down” Procurement efforts often amplify and expedite Supply Chain Risk (e.g. moving contracts from a troubled supplier, delaying supplier payments, Competitive Bidding, etc.)

Existing Supply Chain Risk Management evaluation tools and techniques utilize “lagging” financial indicators (e.g. Sales, Cost Trends, Profit Margin, Sales Growth, etc.)

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The identification and qualification of Risk is essential in the migration from reactive to predictive Risk Management

Supply Chain Risk evaluation tools should qualify Risks against specific Failure Modes

Risk Management efforts should focus on:

- Identification of Supply Chain Failure Modes
- Comparative likelihood of occurrence of Failure
- Current measurement methods and controls

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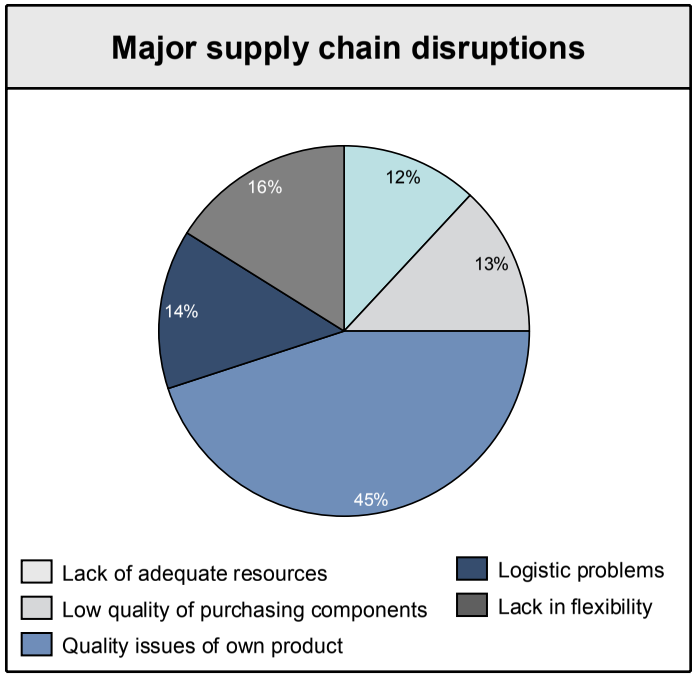
# Unmitigated risk can cause disruptions for a company's supply chain

**Example: Moving Production to low cost countries**




***Disruptions occur as in today's global economy the response to supply chain risk is "reactive"***

*Source: Friedrich Ebert Stiftung*

# Traditional "Cost Down" procurement initiatives often force "Relative Risk" decisions in the Supply Chain

**Example Initiative: Moving Production from Indiana to China**

| | China to Michigan | Indiana to Michigan |
|---|---|---|
| Piece Price | **$35** | $50 |
| Raw Material Transportation (MI to China) vs. (MI to IN) | $4.00 | $.80 |
| Transportation per Piece Ocean/Rail/Truck vs. Truck Only | $9.94 | $.79 |
| Packaging per Piece Expendable vs. Returnable | $1.14 | $.14 |
| Inventory Carrying Cost | $.58 | $.10 |
| Floor Space Cost | $.08 | $.02 |
| **Total Landed Cost per Piece** | **$50.74** | **$51.85** |
| Premium Freight Risk | $250,000/per transport | $1000/per transport |
| Total Inventory Cost In supply Chain | $577,500 | $100,000 |

Procurement initiatives are often based on "Landed Costs" without considering the additional inventory and increased supply chain risk costs

Supply Chain Risk and its unaccounted mitigation costs can often burden cash flow

**Supply Chain Risks can have broad negative impacts when potential Failure Modes become reality**

# Existing Risk Management evaluation tools and techniques are reactive because they utilize lagging indicators

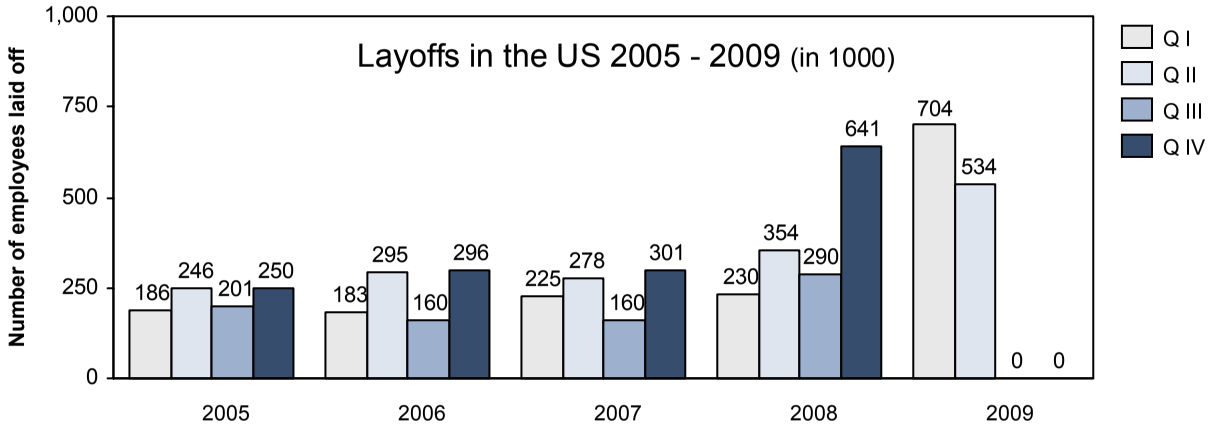
Lagging

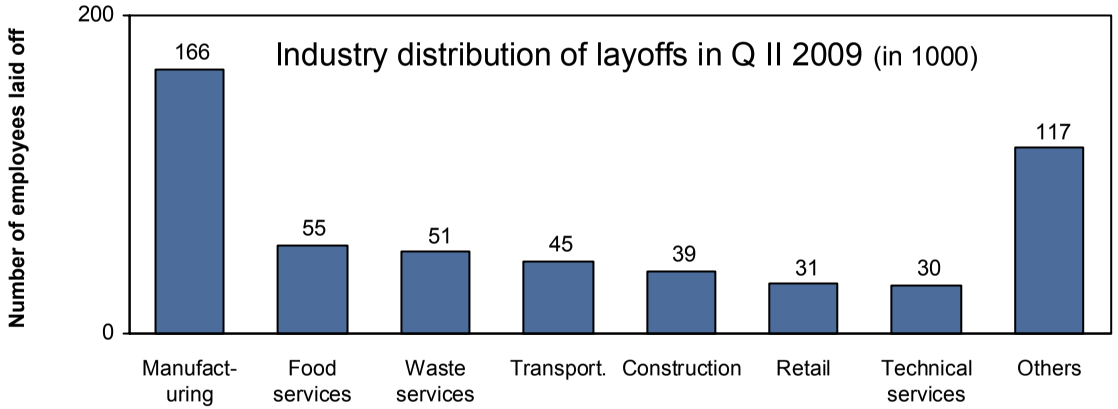
Subjective

| Supplier | Timeframe | % On-Time Delivery | Quality | Technology Advances | Cost Competitiveness | Overall |
|---|---|---|---|---|---|---|
| ABC Stamping | Qtr 1 | 85% | 98% | 20% | 90% | 73.25% |
| DEF Plastics | Qtr 1 | 99% | 96% | 90% | 80% | 91.25% |

**Useful in helping supplier development and current assessment but lacks supply chain risk assessment due to unforeseen "disasters" or happenings**

# Furthermore, deteriorating macro- and micro-economic conditions will pressure companies to move forward with far fewer resources.




Source: Bureau of Labor Statistics (Aug, 2009)

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# Supply Chain Risk Assessment is a five step process that systematically identifies potential failures in the supply chain

| | Identify Study Approach | Identify Failure Modes | Evaluate Failure Modes | Perform Quantitative Analysis | Calculate Risk Level |
|---|---|---|---|---|---|
| **Objectives** | • Define the system and problems of interest<br>• Determine analysis approach type<br>• Identify the level of Study | • Divide system into logical sub-units<br>• Identify failure modes of the system<br>• Determine key input variables | • Evaluate failure modes capable of producing problems<br>• Identify the causes and effects of each failure mode<br>• Determine controls *currently* in place | • Develop severity, occurrence and detection scales<br>• Score severity, occurrence and detection for each Failure Mode, Cause and Control | • Finalize RPN calculation<br>• Prioritize Risks<br>• Include Risk Mitigation activities<br>• Distribute results |
| **Deliverables** | • A defined methodology for the supply chain failure mode analysis | • A list of failure modes. A list of all the way the inputs to a supply chain can fail | • A list of effects each failure will have downstream<br>• A list of causes each failure mode can have<br>• A list of controls in place for each failure | • Severity, occurrence and detection scores across all failure modes<br>• Initial "RPN" calculation | • Finalized "RPN" calculations<br>• Prioritized list of Supply Chain Failure Modes based on Supply Chain risk |

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# Several Tools can be used to Support Risk Identification, Analysis and Evaluation

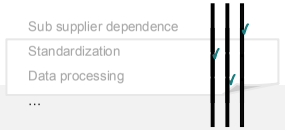
## Supply Chain FMEA

- Structured scheme to analyze failures and their effects
- Extensive, complex method

## Supply Chain Map

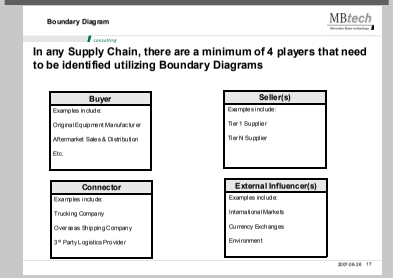
- Identification of supply chain parties and related data
- Visualization of supply chain

## Supply Chain Audits

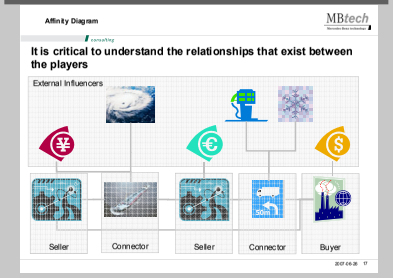



- Customized list of questions
- Standardized risk identification and facilitation of data processing

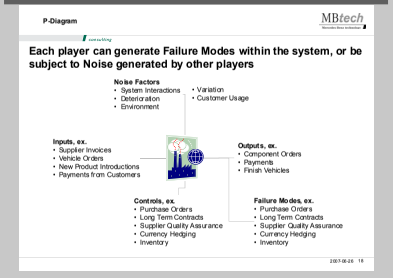
## Boundary Diagrams




## Affinity Diagrams




## P-Diagrams




## Risk Calculation

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# Example: Evaluation Process and Decision Matrix for the Identification of risky Supply Chains


| | Approach |
|---|---|
| –Risky Supply Chain: | FMEA, Easy Map & Audit |
| –+ Bad evaluation in EBSC or SRA ➔ Risky Supply Chain | Easy Map & Audit Questionnaire |
| –+ Good evaluation in EBSC or SRA ➔ Low Risk Supply Chain | Easy Map & Audit Questionnaire |
| –Low Risk Supply Chain | Audit Questionnaire |

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# In any Supply Chain, there are a minimum of 4 players that need to be identified utilizing Boundary Diagrams

| Buyer |
| --- |
| Examples include:<br>Original Equipment Manufacturer<br>Aftermarket Sales & Distribution<br>Etc. |

| Seller(s) |
| --- |
| Examples include:<br>Tier 1 Supplier<br>Tier N Supplier |

| Connector |
| --- |
| Examples include:<br>Trucking Company<br>Overseas Shipping Company<br>3rd Party Logistics Provider |

| External Influencer(s) |
| --- |
| Examples include:<br>International Markets<br>Currency Exchanges<br>Environment |

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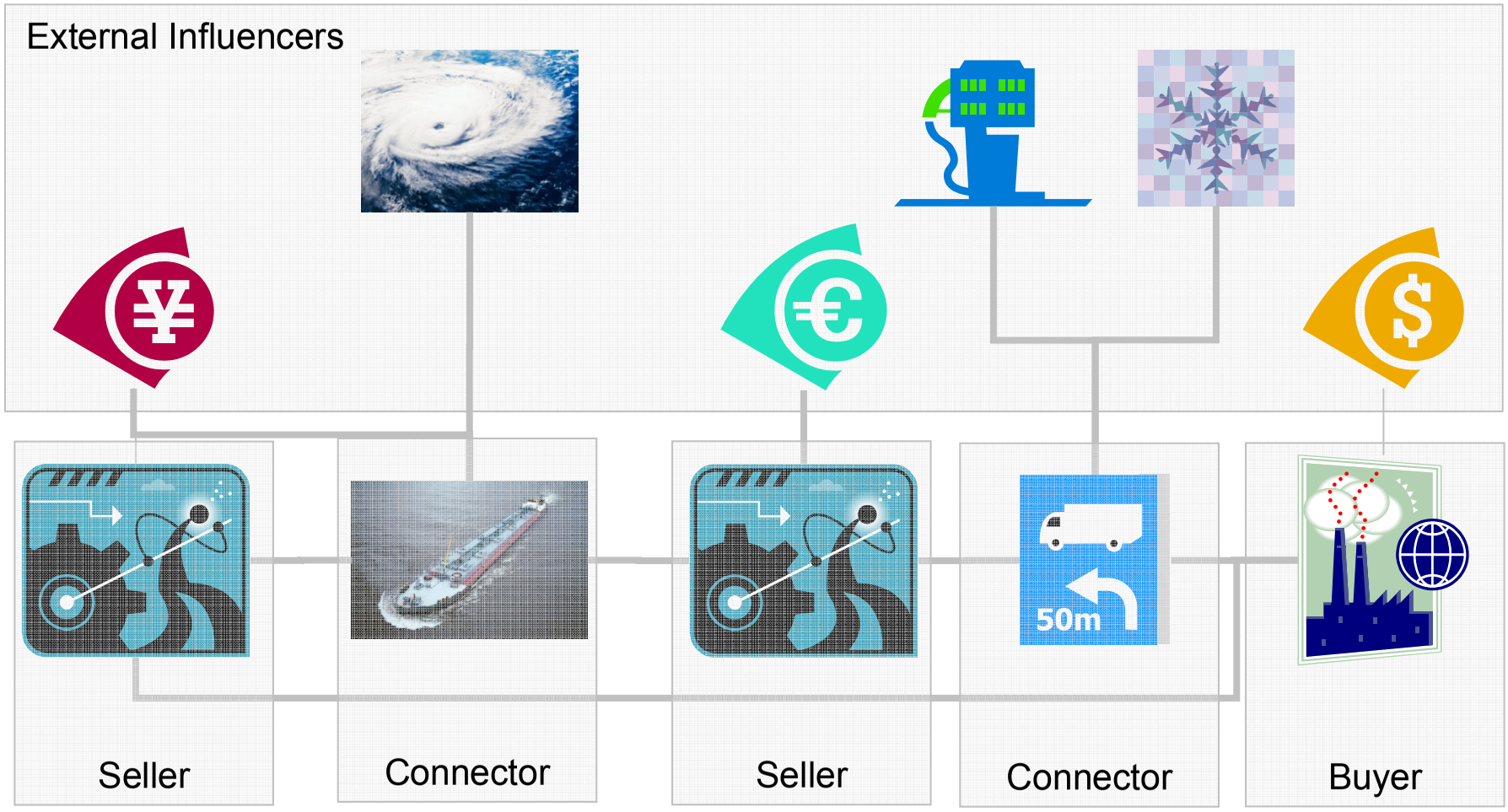
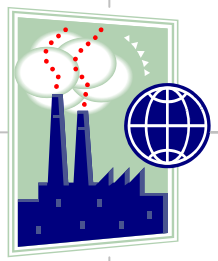
# It is critical to understand the relationships that exist between the players



# Each player can generate Failure Modes within the system, or be subject to Noise generated by other players

**Noise Factors**
- System Interactions
- Deterioration
- Environment
- Variation
- Customer Usage

**Inputs, ex.**
- Supplier Invoices
- Vehicle Orders
- New Product Introductions
- Payments from Customers



**Outputs, ex.**
- Component Orders
- Payments
- Finish Vehicles

**Controls, ex.**
- Purchase Orders
- Long Term Contracts
- Supplier Quality Assurance
- Currency Hedging
- Inventory

**Failure Modes, ex.**
- Purchase Orders
- Long Term Contracts
- Supplier Quality Assurance
- Currency Hedging
- Inventory

# Three factors are necessary in the development of a Supply Chain FMEA

| | |
|---|---|
| 1. Reaction Severity | How will the Failure Mode be received through the Supply Chain? |
| 2. Event Probability & Trends | How likely is the Failure Mode to occur within the Supply Chain?<br><br>What is the predicted likelihood that the Failure Mode will occur within the Supply Chain? |
| 3. Outcome Manifestation | Where will the Failure Mode be felt in the Supply Chain?<br><br>Concurrently,<br><br>When will the Failure Mode be felt in the Supply Chain? |

**Supply Chain Risk = Reaction Severity x Event Probability x Outcome Manifestation**

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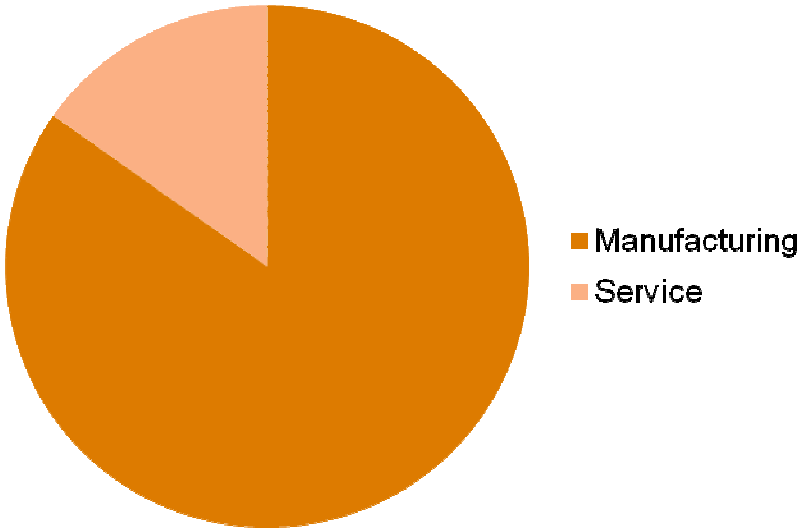
# Research Partnership with Western Michigan University

- Scope
  - Focus:  Questionnaire on Risk and Failure Modes
  - Target:  Procurement Officers & Managers, Supply Chain Executives, Plant Management
  - Scope:  Multi-Industry
  - Renewable:  Yearly

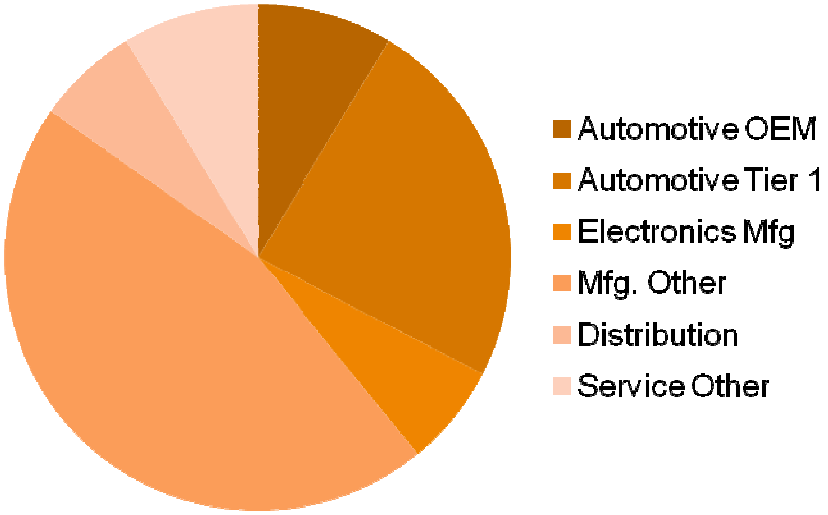
- Data Utilization
  - Failure Mode Identification
  - Relative Risk Levels
  - High Risk Events in the Supply Chain
  - Trends
  - Metrics and Sensors
  - Current Corrective Actions

# Respondent Summary

## Industry Sector

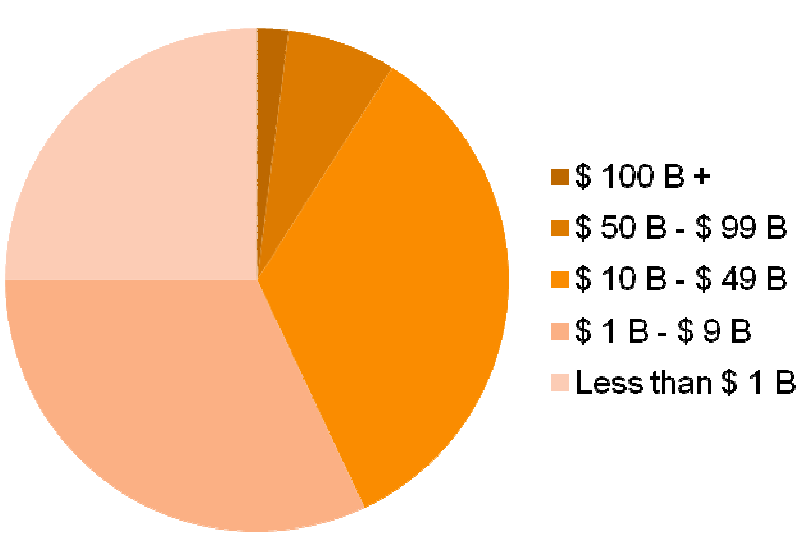



## Sector Details

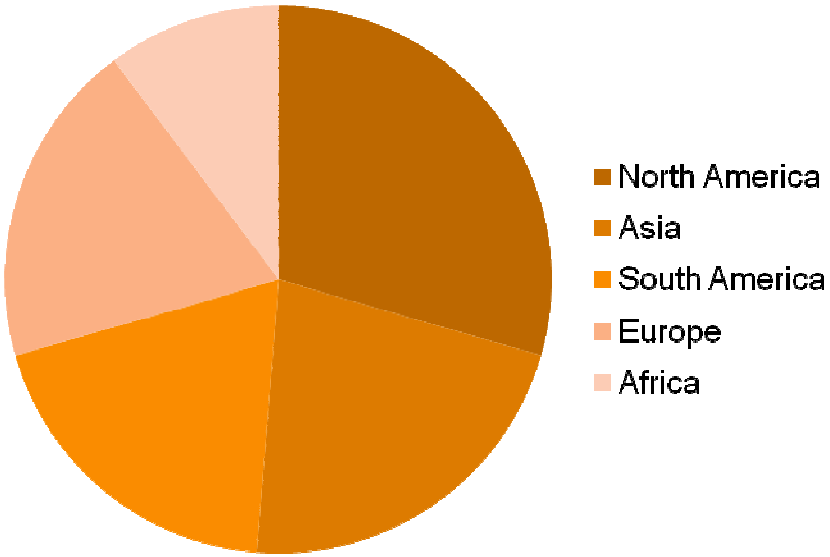


# Respondent Summary

## Annual Sales




## Operating Regions



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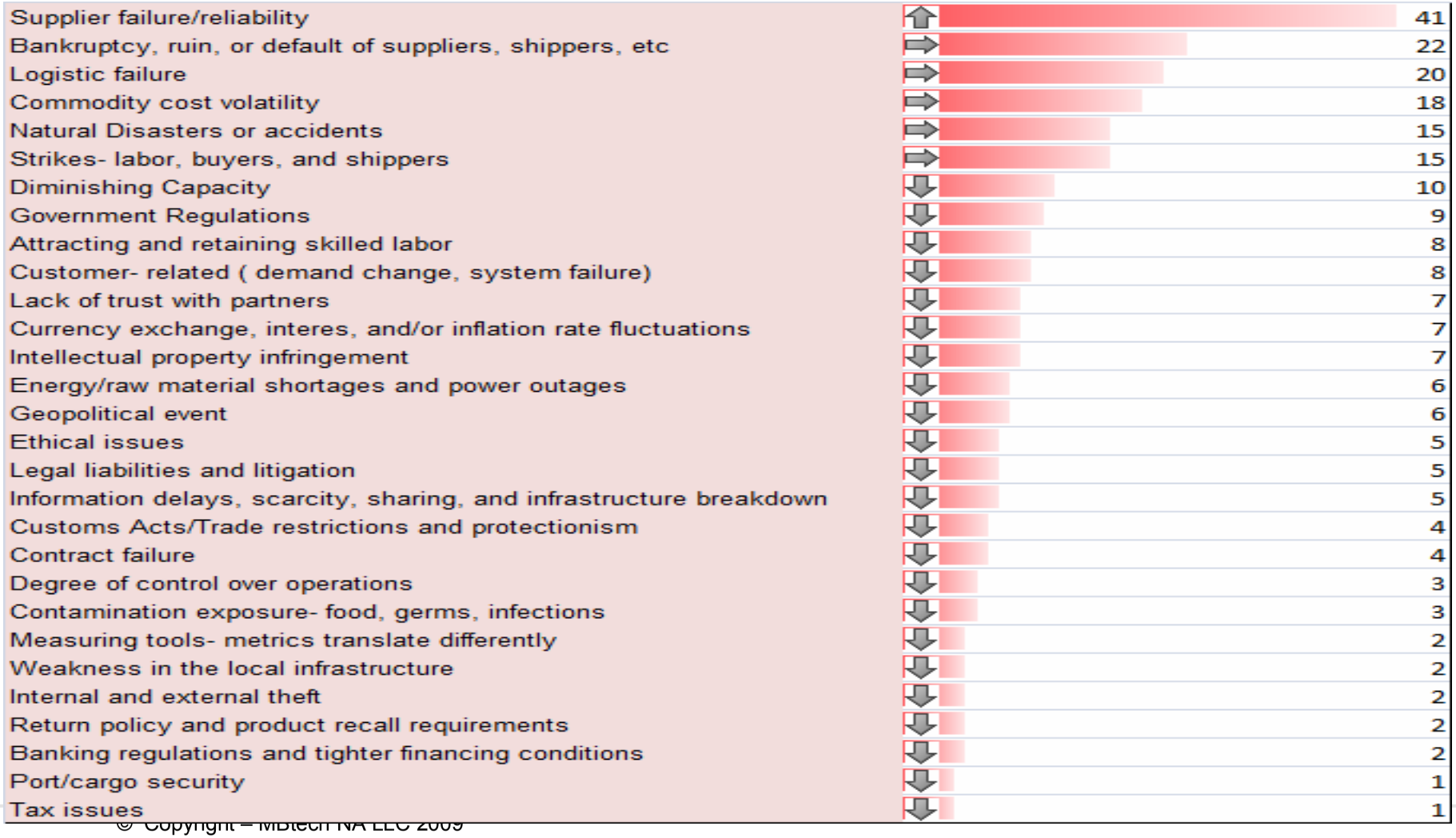
**Respondents were asked to rank order five of the following risks which would have the greatest severity or impact on the supply chain if it occurred (e.g., 1=most severe, 2=second most severe, etc.). The numbers below indicate the frequency of responses.**



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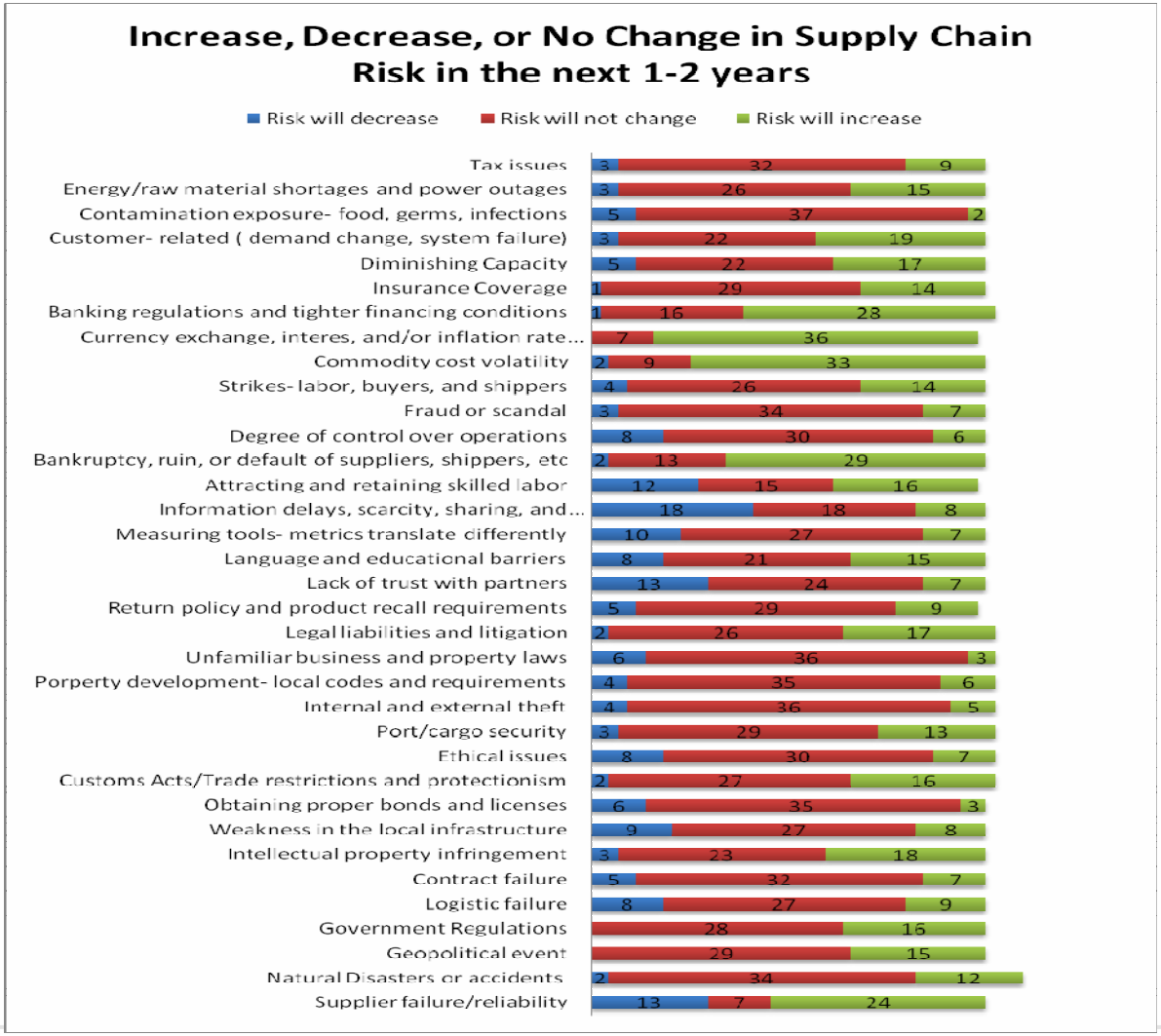
**The respondents were asked if each supply chain risk would increase, stay the same, or decrease in the next 1-2 years?**



**Respondents were asked which techniques or tools are currently utilized to identify and analyze risk within the supply chain.**

- Initial supplier evaluations
- Financial risk assessment
- Supplier quality audits
- Capacity planning for operations and suppliers
- Lead time analysis for project management
- Supplier scorecard
- Management review
- Supplier risk analysis based on accounts payable performance
- Contingency plans
- On-site capability review
- Forecasting techniques
- Safety stock
- Capacity and network planning,
- Multi-sourcing
- Price hedging for commodities
- Back up carriers
- Historical data review
- Cross-functional team review
- Risk management group review
- Project service levels
- Information sharing with suppliers
- Total spend management
- Open communication
- Supplier competency reviews
- Benchmarking
- Life cycle management
- Failure mode & effects analysis
- Develop local supply base
- Contract management & leverage
- Demand planning
- Inventory management
- Vendor managed inventory.

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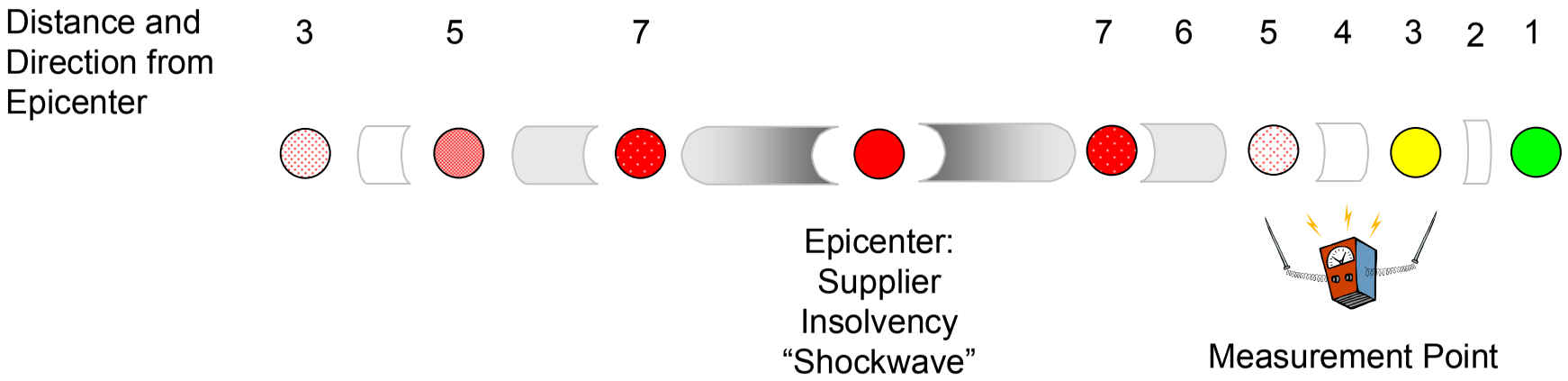
# Reaction Severity can only be measured at one point in the Supply Chain, but can be felt throughout.




Reaction Severity Rules

1. Measurement can be taken at only one point in the Supply Chain
2. Effect can be inferred by the closeness to the Epicenter
3. Traditionally, downstream players are affected far more than upstream players

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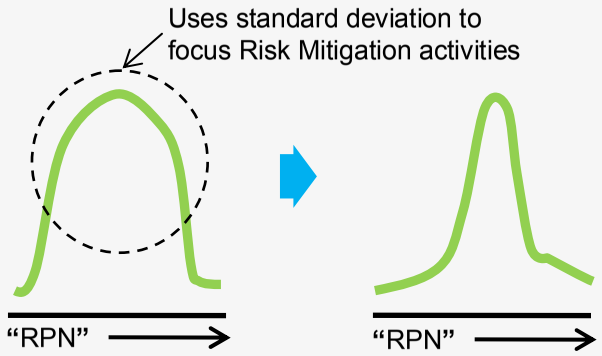
# Supply Chain Risk Level Control manages risk through active "RPN" and mitigation costs trade-offs

## Risk Management by Reducing Standard Deviation

- Reducing the standard deviation in a supply chain's risk profile



# Certain factors were identified as having a critical impact on predisposition and progress toward managing risks in SCM.

These factors included:

- Consistent and well communicated Corporate Strategy
- Cohesive Supply Chain Organization
- Focus on Process Management
- Predictive Performance Metrics
- Utilized information & technology

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# The Supply Chain FMEA is developed collaboratively with Purchasing, Engineering, Logistics, Finance, and Supplier Management

Commodity: Carpet/Floor Covering

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Participants: NN

Date: 09.01.09

| ITEM | FAILURE MODE | EFFECT | S | CAUSE | O | PREVENTATIVE DETECTION | CONTROL SYSTEMS | D | RPN | PROPOSED CORRECTIVE ACTION | RS | RO | RD | RRPN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Supplier Failure / Reliability | Customer Dissatisfaction | 9 | Pre-mature wear through due to product specifications not being met | 3 | Pre-Production Approval Process | Process Audit | 5 | 135 | Include item in post sales customer satisfaction survey. | 9 | 3 | 4 | 108 |
| | | | | | | | | | | Enforce Part Sample Submission process | 9 | 3 | 3 | 81 |
| | | Long Term Warranty Issues | 9 | Pre-mature wear through due to material specifications not being met | 3 | Pre-Production Approval Process | Process Audit | 5 | 135 | Include item in post sales customer satisfaction survey | 9 | 3 | 4 | 108 |
| | | | | | | | | | | Enforce Part Sample Submission process | 9 | 3 | 3 | 81 |
| | | Intermittent Warranty Issues | 7 | Pre-mature wear through due to material specifications not being met | 2 | Pre-Production Approval Process | Process Audit | 7 | 98 | Material Lot Level Traceability | 7 | 2 | 3 | 42 |
| 2 | Bankruptcy, ruin, or default of suppliers, shippers, etc. | Complete liquidation; Need to re-source component to new supplier | 6 | Poor supplier financial health | 4 | Annual Supplier Meetings | Supplier Financial Risk Management Team; IP Ownership | 5 | 120 | Consolidate supply base | 7 | 5 | 3 | 105 |
| | | | | | | | | | | Diversify supply base | 5 | 4 | 5 | 100 |
| | | | | | | | | | | Review and modify (as required) payment terms with suppliers quarterly | 5 | 4 | 3 | 60 |
| | | | | | | | | | | Dual source critical commodities and services | 6 | 2 | 5 | 60 |
| | | Supplier continues to operate; Renegotiation of all contracts | 7 | Poor supplier financial health | 5 | Annual Supplier Meetings | Supplier Financial Risk Management Team | 5 | 175 | Consolidate supply base | 8 | 6 | 3 | 144 |
| | | | | | | | | | | Diversify supply base | 6 | 4 | 5 | 120 |
| | | | | | | | | | | Review and modify (as required) payment terms with suppliers quarterly | 6 | 4 | 3 | 72 |
| | | | | | | | | | | Dual source critical commodities and services | 7 | 2 | 5 | 70 |
| 3 | Logistics Failure | Production Shutdown | 7 | Supplier Production does not meet requirements | 3 | Daily Planning Volume Transmission | EDI | 3 | 63 | Collabarative Planning & Forecasting | 8 | 1 | 2 | 16 |
| | | | 7 | Inclement weather does not allow for on-time delivery | 3 | Daily Planning Volume Transmission | EDI | 3 | 63 | Increase safety stock levels to accommodate late shipments | 8 | 2 | 3 | 48 |
| | | | 7 | Short Ship of components | 4 | Daily Planning Volume Transmission | Balanced Scorecard | 4 | 112 | Increase safety stock levels to accommodate late shipments | 8 | 2 | 3 | 48 |
| | | | 7 | Short Ship of components | 4 | Daily Planning Volume Transmission | EDI | 3 | 84 | Increase safety stock levels to accommodate late shipments | 8 | 2 | 3 | 48 |

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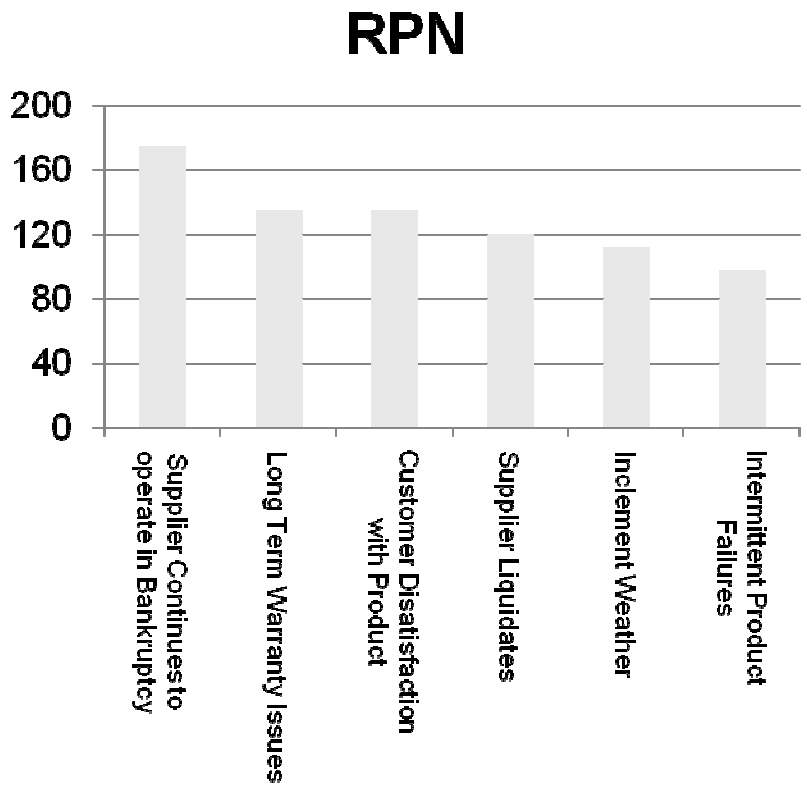
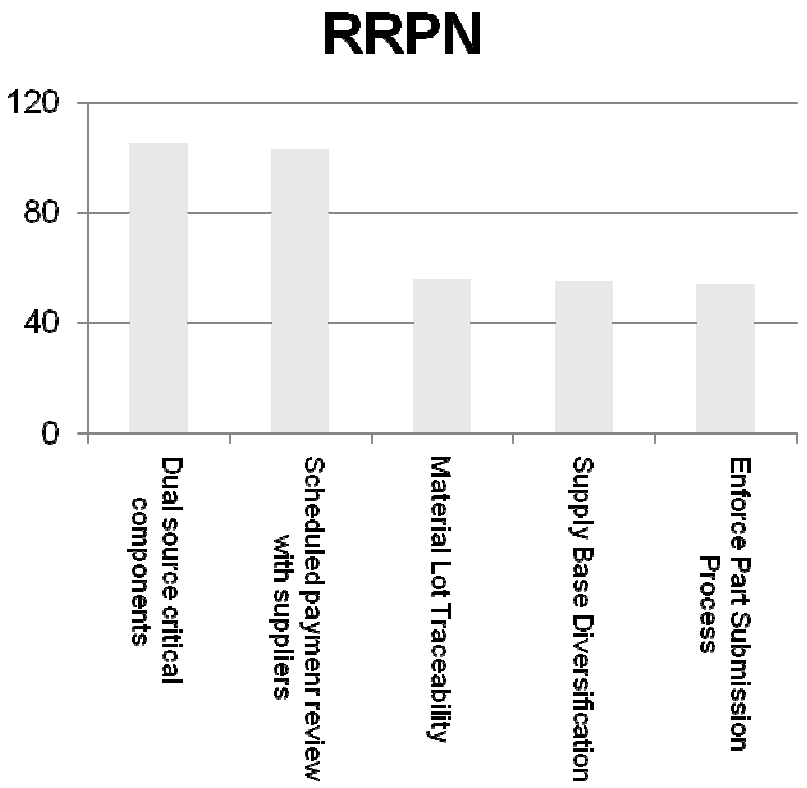
**The Supply Chain FMEA is used to prioritize efforts, compare/contrast mitigation strategies, and provide comparison to industry benchmarks**



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