Supply Chain Risk Management (SCRM)

Basic concepts and terminology

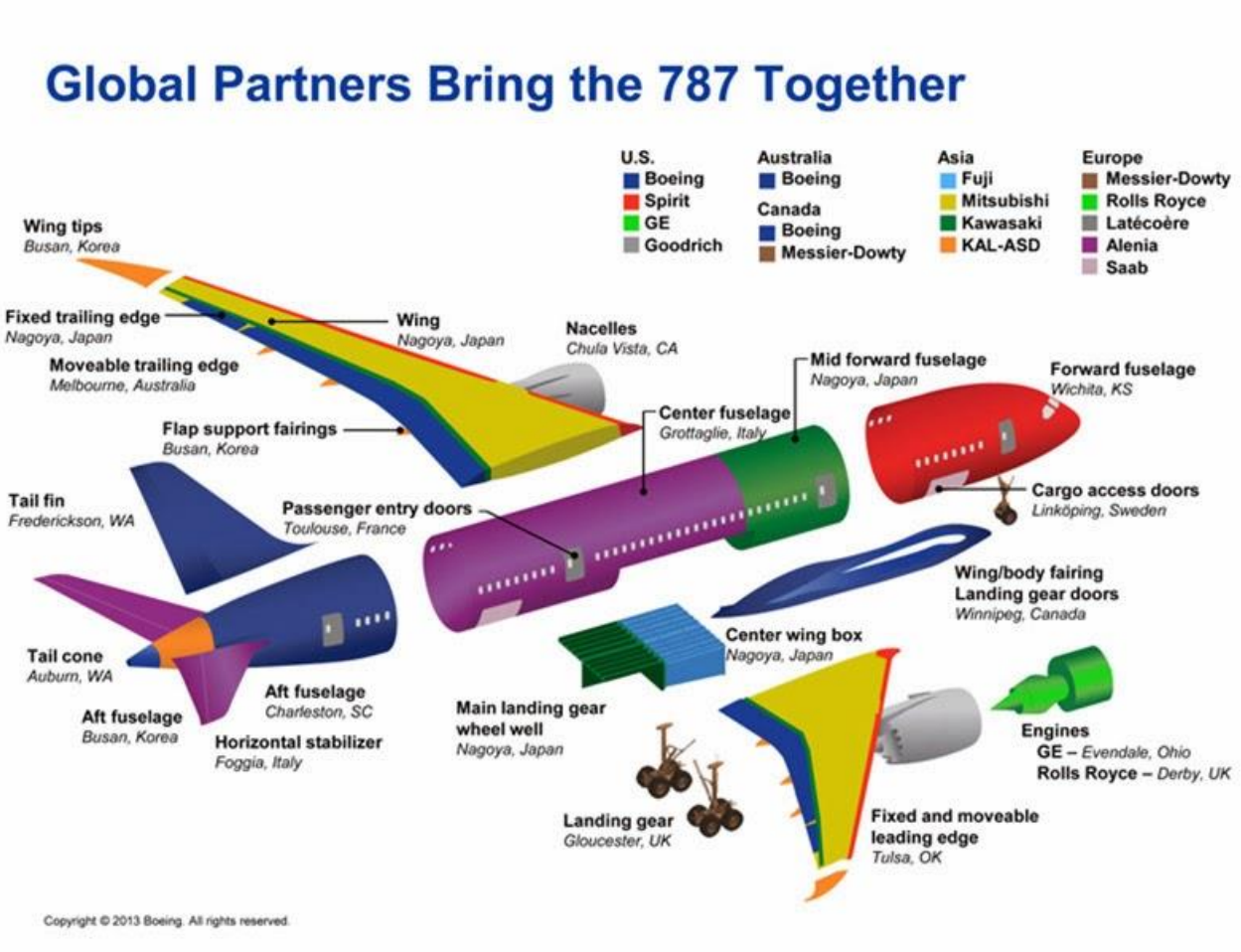
By Thomas K. Dasaklis

- Introduction
- Risk and Risk Management (definitions)
- From Risk Management to Supply Chain Risk Management
- Risk identification across the Supply Chain
- Managing risk in the supply chain
- Measuring Risk in the supply chain
- Best practices

Introduction

Boeing's supply chain (Boeing 2013).

- The 787 alone has about 2.3 million parts (only some parts, like the fuselage, are built by Boeing)
- Other components are contracted out for a supplier to build.
- Boeing has a relationship with 5,400 supplier factories, including sub-tier suppliers
- More than 750 million components and assemblies were procured in 2012
- 500,000 people are employed through the Boeing supply chain



Risk (definitions)

Risk = (the probability that some event will occur)X(the consequences if it does occur)

Risk in ISO 31000:2009 is neutral; the consequences associated with a risk can enhance the achievement of objectives (i.e. positive consequences) or can limit or diminish the achievement of objectives (i.e. negative consequences).

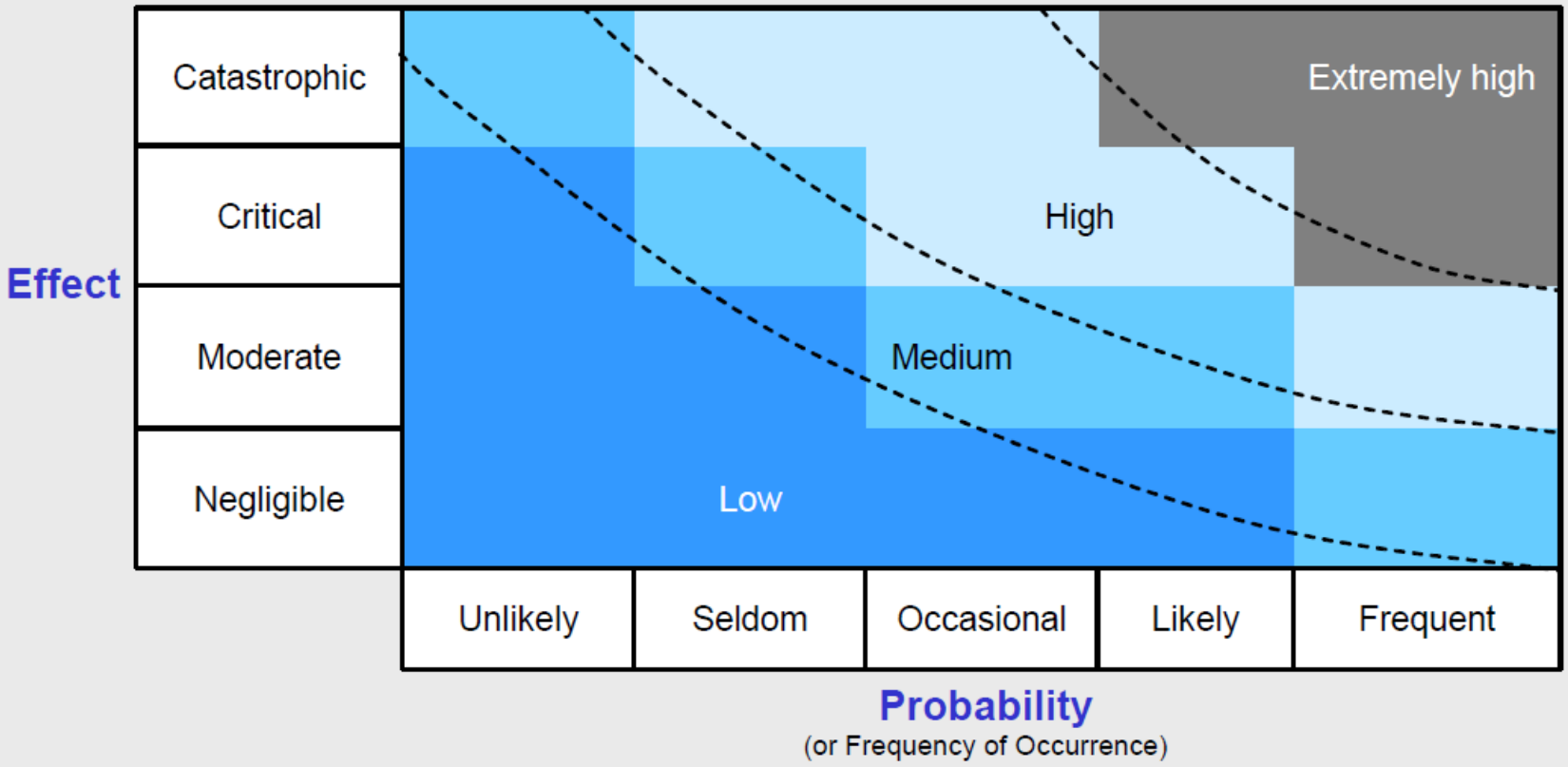
Positive or Negative is dependent on context

Risk≠Uncertainty

Risk: We don't know what is going to happen next, but we do know what the distribution looks like.

Uncertainty: We don't know what is going to happen next, and we do not know what the possible distribution looks like.

Risk (definitions)



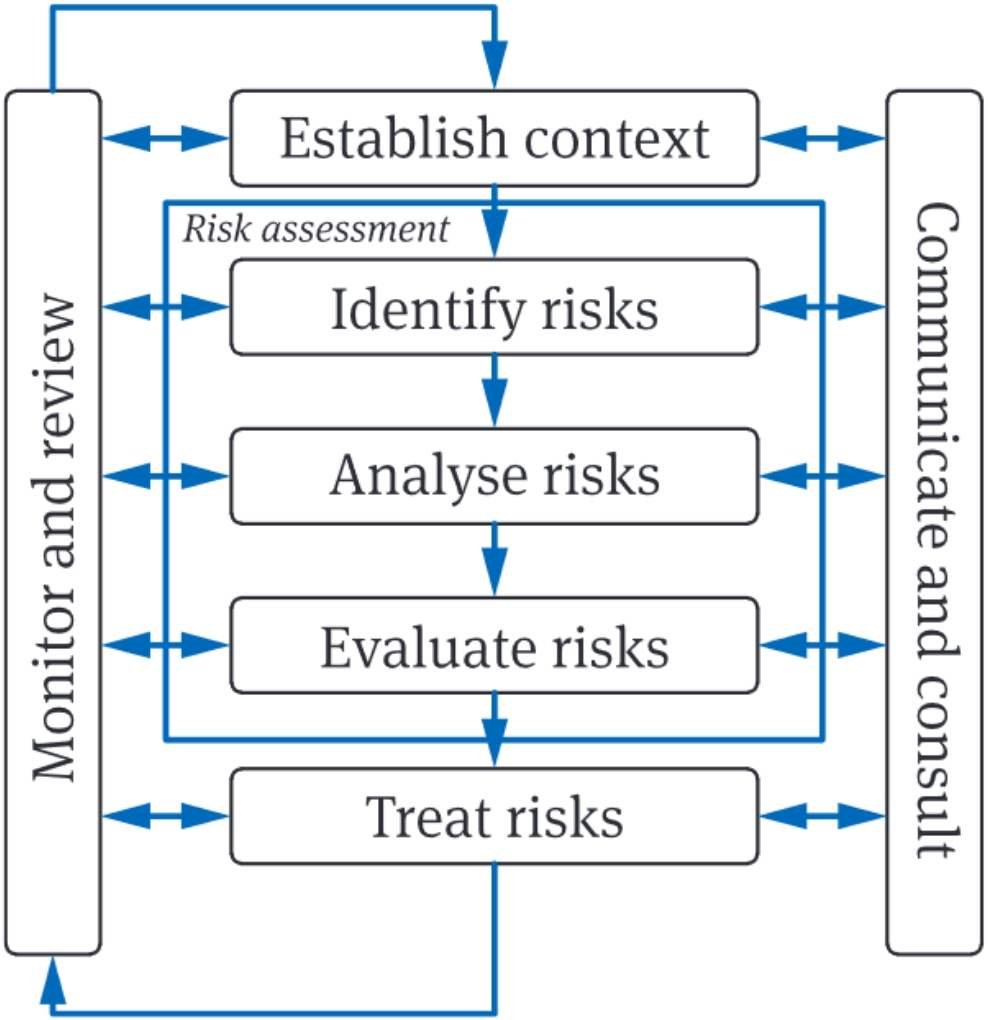
Risk Management

Risk management refers to the coordinated activities that an organization takes to direct and control risk.

Vulnerability: Degree to which people, property, resources, systems, and cultural, economic, environmental and social activity is susceptible to harm, degradation or destruction on being exposed to a hostile agent or factor.

Resilience: Adaptive capacity of an organization/system in a complex and changing environment

Risk Management



Define the scope of enquiry/objectives:
Identify relevant stakeholders/areas involved or impacted
Internal and/or external environment/factors

What could happen
How and where it could happen
Why it could happen
What is the impact or potential impact

Identify the causes, contributing factors and actual or potential consequences
Identify existing or current controls
Assess the likelihood & impact/ consequence to determine the risk rating

Is the risk acceptable or unacceptable
Does the risk need treatment or further action
Do the opportunities outweigh the threats

If existing controls are inadequate identify further treatment options
Devise a treatment plan
Seek endorsement & support for treatment
Determine the residual risk rating once the risk is treated

The ISO 31000:2009 risk management process

From Risk Management to Supply Chain Risk Management

- Study which analyzed over 800 supply chain disruptions that took place between 1989 and 2000
- Firms that experienced major supply chain disruptions saw the following consequences (Hendricks and Singhal 2005):
  - Sales were down 93 percent, and shareholder returns were 33-40 percent lower over a three-year period
  - Share price volatility was 13.5 percent higher
  - Operating income declined by 107 percent, and Return On Assets (ROA) declined by 114 percent.

From Risk Management to Supply Chain Risk Management

The 2011 Japan earthquake had the following implications:

- Toyota suspended production of the Prius in Japan after this event, losing 140,000 badly needed vehicles.
- Boeing experienced major delays as a result of the tsunami because the impacted Japanese suppliers produce 35% of Boeing 787 components and 20% of Boeing 777 components.
- General Motors had to halt production in several plants because of shortages from Japanese suppliers.
- Honda faced severe problems because 113 of its suppliers were located in the affected region of Japan.

These twin disasters in Asia in 2011 produced an estimated $240 billion in losses.

From Risk Management to Supply Chain Risk Management

Definitions of SCRM (Ho, Zheng et al. 2015)

Authors	Definitions of SCRM	Scopes
Jüttner, Peck, and Christopher (2003) and Jüttner (2005, 124)	The identification and management of risks for the supply chain, through a coordinated approach amongst supply chain members, to reduce supply chain vulnerability as a whole	Identification and management processes
Norrman and Jansson (2004, 436)	To collaborate with partners in a supply chain apply risk management process tools to deal with risks and uncertainties caused by, or impacting on, logistics related activities or resources	Generic processes
Tang (2006a, 453)	The management of supply chain risks through coordination or collaboration among the supply chain partners so as to ensure profitability and continuity	Generic processes
Goh, Lim, and Meng (2007, 164–165)	The identification and management of risks within the supply network and externally through a coordinated approach amongst supply chain members to reduce supply chain vulnerability as a whole	Identification and management processes
Thun and Hoenig (2011, 243)	Characterised by a cross-company orientation aiming at the identification and reduction of risks not only at the company level, but rather focusing on the entire supply chain	Identification and mitigation processes

Supply Chain Council: SCRM is the systematic identification, assessment and mitigation of potential disruptions in logistics networks with the objective to reduce their negative impact on the logistics network's performance

Risk identification across the supply chain

Supply chain **vulnerability**:

- the properties of a supply chain system; its premises, facilities, and equipment, including its human resources, human organization and all its software, hardware, and net-ware, that may weaken or limit its ability to endure threats and survive accidental events that originate both within and outside the system boundaries.
- determined to a large extent by the degree of complexity of the network.

Supply chain **resilience**:

- the ability of the supply chain to return to its original or desired state after being disturbed, e.g., its ability to absorb or mitigate the impact of the disturbance.

Risk identification across the supply chain

Current business trends that increase the **vulnerability** (Faisal 2009) to risks in supply chains are:

- increased use of outsourcing of manufacturing and R&D to suppliers;
- globalization of supply chains;
- reduction of supplier base;
- more intertwined and integrated processes between companies;
- reduced buffers;
- shorter lead times requirements;
- shorter product life cycles and compressed time-to-market;
- increased product/service complexity; and
- capacity limitation of key components.

Risk identification across the supply chain

Risk dimensions in the supply chain

1. Disruptions to the supply of goods or services, including poor quality, which cause downtime and consequent failure to satisfy the customer's requirements on time.
2. Volatility in terms of price may result in difficulties in passing on price changes to the customer and potentially have consequences in lost profit.
3. Poor quality products or service, either upstream or downstream, may impact on the level of satisfaction of the customer with consequences for future revenues and possibly more immediate claims for financial compensation.
4. The reputation of the firm, often generated by issues not directly related to the supply chain itself, may pose risks. Inadvertant comments by senior executives or the failure to endorse certain protocols may damage the reputation of the organization.

Risk identification across the supply chain

Category of Risk	Drivers of Risk
Disruptions	■ Natural disaster ■ Labor dispute ■ Supplier bankruptcy ■ War and terrorism ■ Dependency on a single source of supply as well as the capacity and responsiveness of alternative suppliers
Delays	■ High capacity utilization at supply source ■ Inflexibility of supply source ■ Poor quality or yield at supply source ■ Excessive handling due to border crossings or to change in transportation modes
Systems	■ Information infrastructure breakdown ■ System integration or extensive systems networking ■ E-commerce
Forecast	■ Inaccurate forecasts due to long lead times, seasonality, product variety, short life cycles, small customer base ■ "Bullwhip effect" or information distortion due to sales promotions, incentives, lack of supply-chain visibility and exaggeration of demand in times of product shortage

Risk identification across the supply chain

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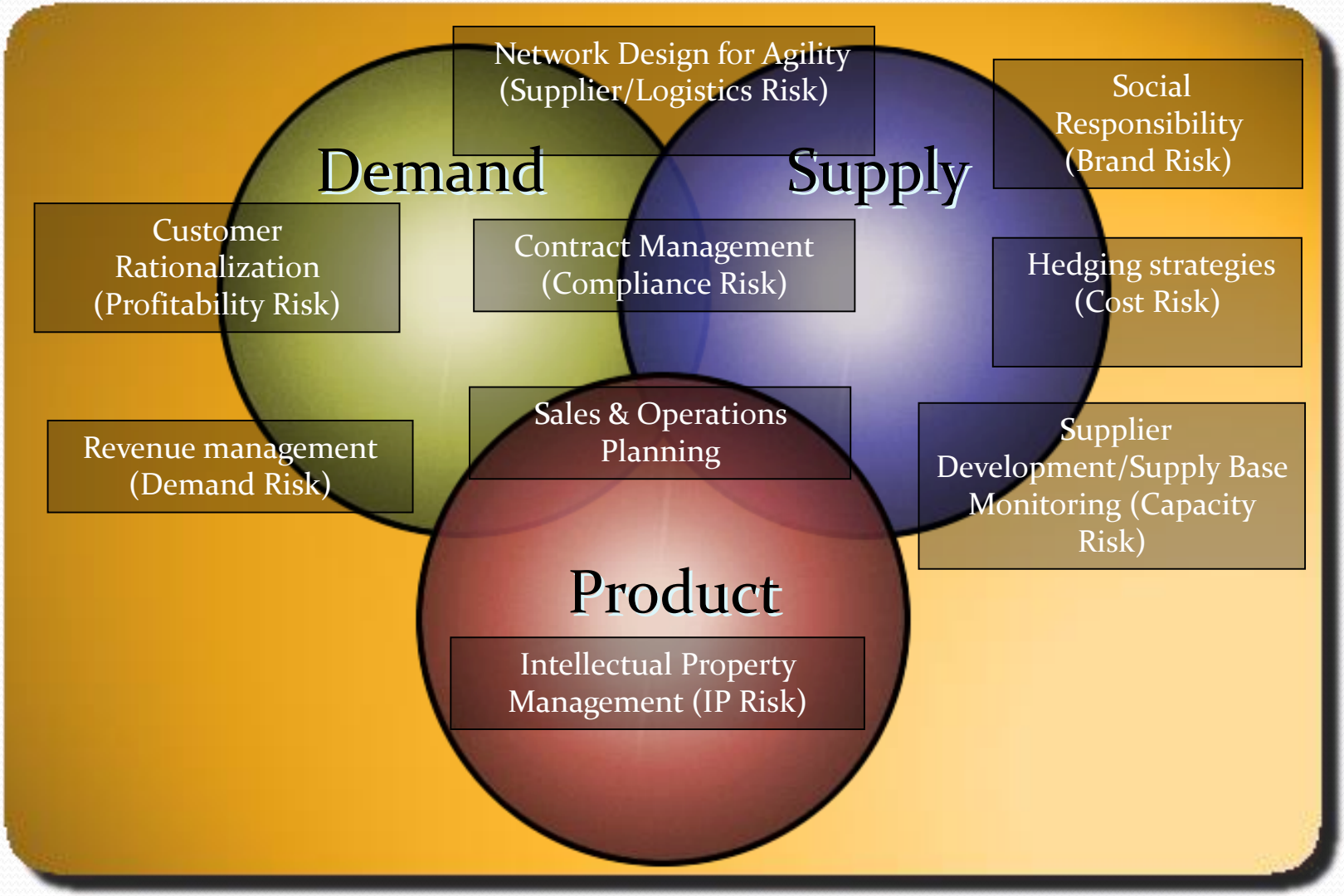
Intellectual Property	■ Vertical integration of supply chain ■ Global outsourcing and markets
Procurement	■ Exchange rate risk ■ Percentage of a key component or raw material procured from a single source ■ Industrywide capacity utilization ■ Long-term versus short-term contracts
Receivables	■ Number of customers ■ Financial strength of customers
Inventory	■ Rate of product obsolescence ■ Inventory holding cost ■ Product value ■ Demand and supply uncertainty
Capacity	■ Cost of capacity ■ Capacity flexibility

Managing risk in the Supply Chain



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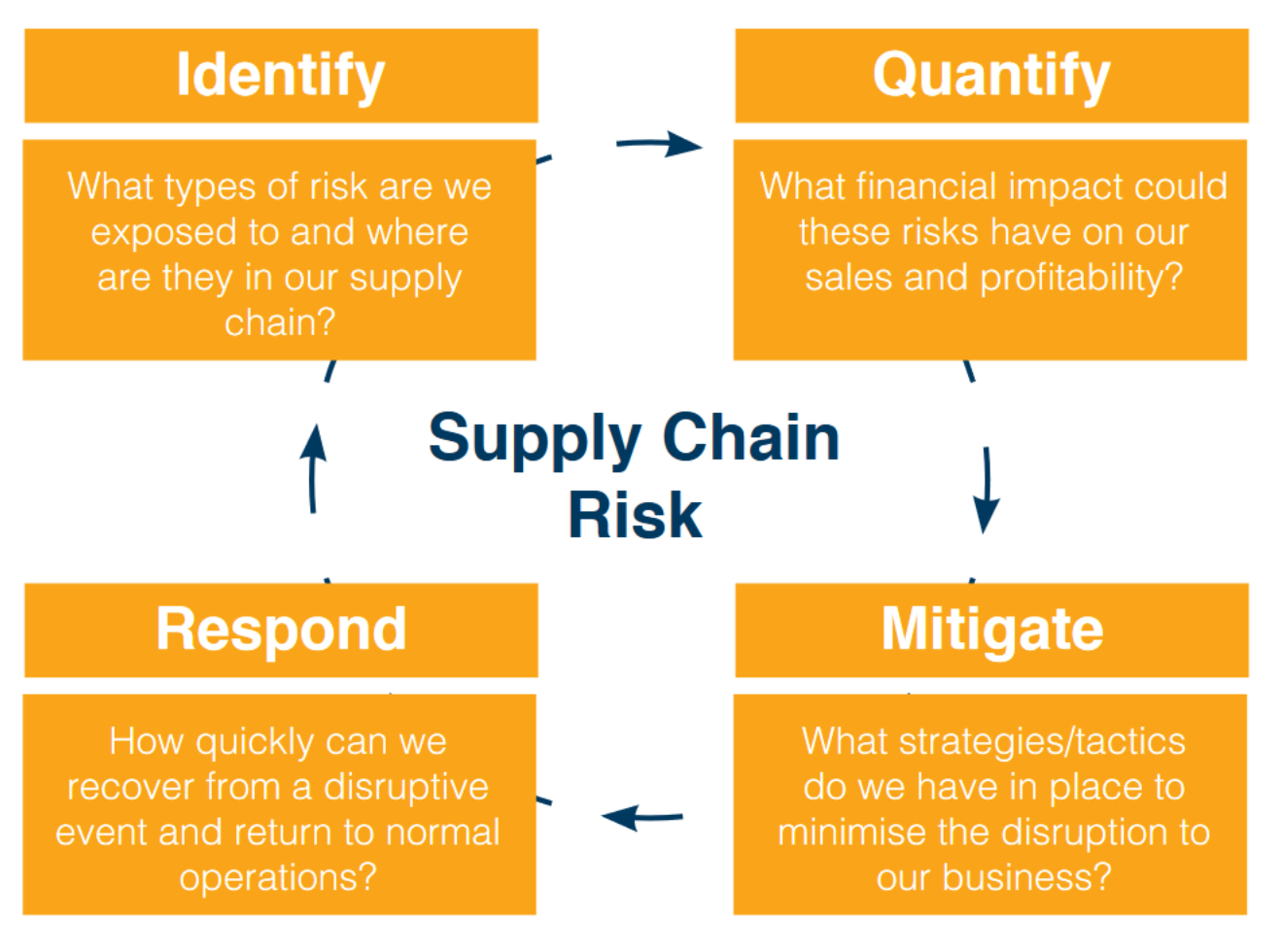

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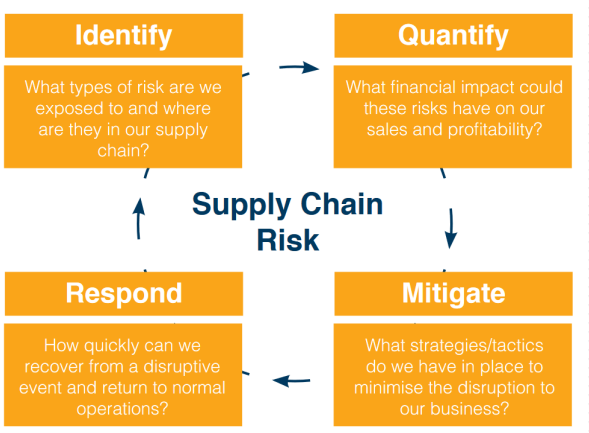
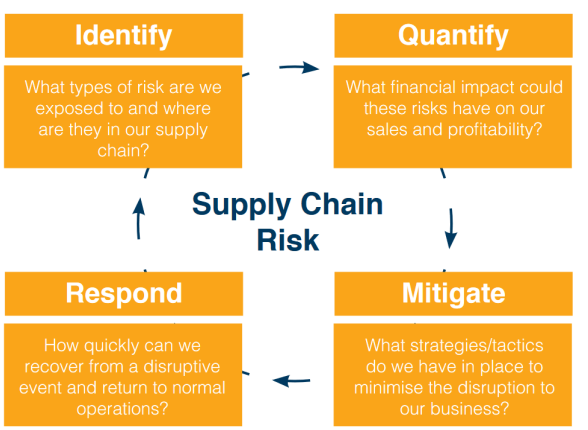


Risk identification and assessment: At a fundamental level, the questions here include: what risks are we exposed to within our supply chains? Who are our direct suppliers and where are their production and distribution sites located? Digging a little deeper, who are our suppliers' suppliers and what do their footprints look like?

Risk quantification: Limited resources dictate that we focus our risk management efforts on where they are most needed and beneficial. The key question here is: where would disruptions have the biggest negative impact on our sales revenue and profitability? Putting some hard dollar figures on this is vital not only for targeting resources, but also for securing executive support and investment.

Managing risk in the Supply Chain



Risk mitigation: Given what we know about the composition of our supply networks and our most critical risks, what tactics and strategies should we put in place to minimize and mitigate the threat of potential disruptions? How do we build greater resilience into our supply chains and the way we do business across the globe?

Event response and recovery: When disaster strikes how quickly can we and our suppliers implement those mitigation plans and ensure the resumption of normal daily operations? How successfully can we limit the impact on our customers and the damage to our top and bottom lines?

Managing risk in the Supply Chain

Principles for specifying, assessing and mitigating risks in supply chains:

(1) before expecting other supply chain members to control risk, the core activity must do so internally;

(2) diversification reduces risk – in supply chain contexts, this can include facility locations, sourcing options, logistics, and operational modes;

(3) robustness to disruption risks is determined by the weakest link;

(4) prevention is better than cure – loss avoidance and preemption are preferable to fixing problems after the fact;

(5) leanness and efficiency can lead to increased vulnerability;

(6) backup systems, contingency plans, and maintaining slack can increase the ability to manage risk;

Managing risk in the Supply Chain

(7) collaborative information sharing and best practices are needed to identify vulnerabilities in the supply chain;

(8) linking risk assessment and quantification with risk management options is crucial to understand potential for harm and to evaluate prudent mitigation;

(9) modularity of process and product designs as well as other aspects of agility and flexibility can provide leverage to reduce risks, especially those involving raw material availability and component supply; and

(10) total quality management principles such as Six-Sigma give leverage in achieving greater supply chain security and reduction of disruptive risks as well as reducing operating costs.

Measuring risk in the supply chain

Risk Exposure Index developed by the MIT Forum for Supply Chain Innovation:

- Allows companies to understand the dependencies within their supply chains, estimate hard-dollar impacts and prioritize their risk mitigation efforts
- Provides the financial impact that each supplier site along the supply chain would have if it were taken out of action temporarily. This is calculated by estimating the hit to the company's sales revenue during the time it would take a supplier to return to normal operations, whether two, four, eight weeks or longer – in other words, the **time to recovery** (TTR), a key metric in supply chain risk management
- Such a mapping exercise flags up which nodes in the supply chain would have the biggest financial impact if a disruptive event (regardless of type) happened
- Implemented to Ford

Best practices

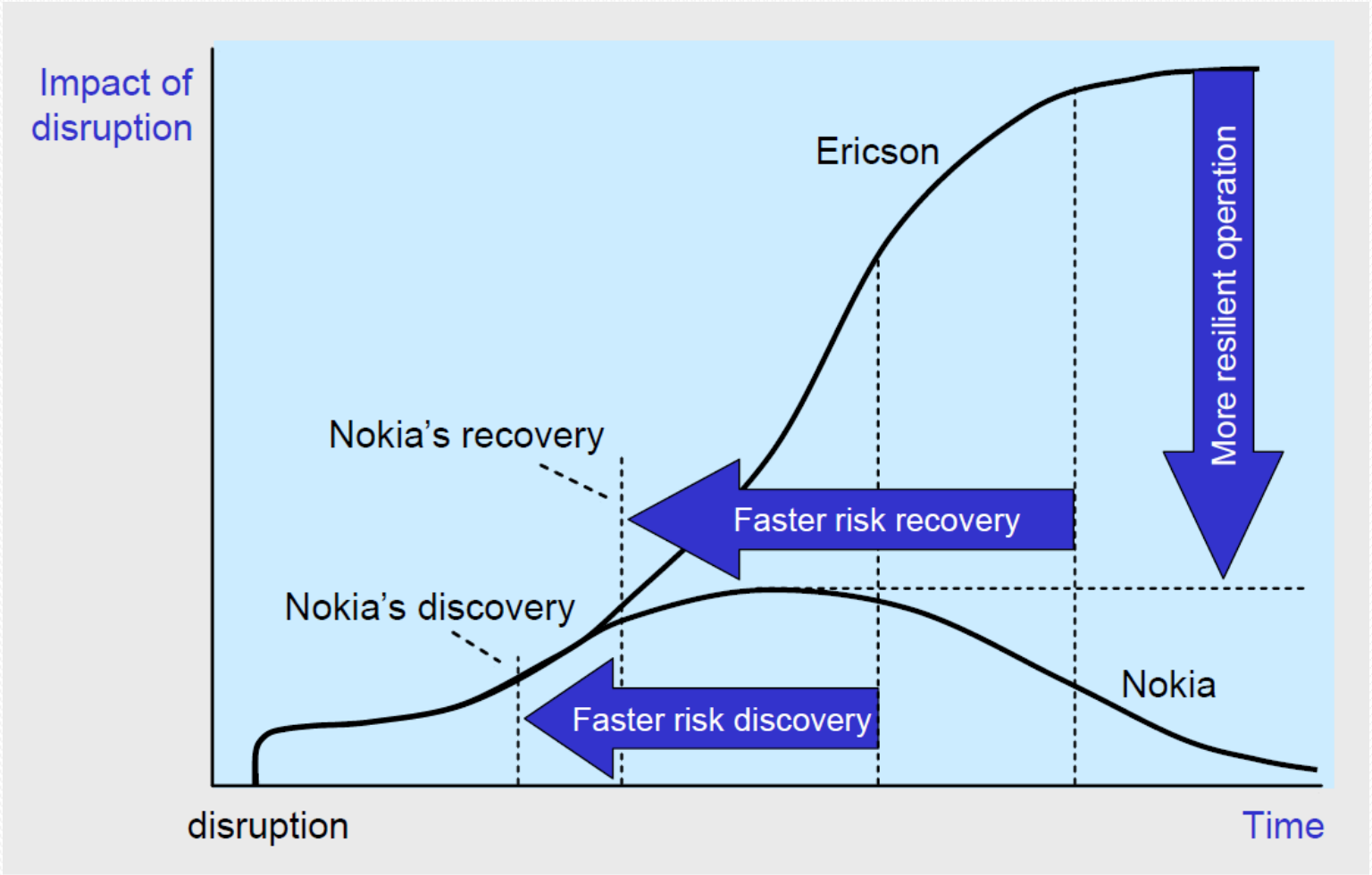
- On March 17, 2000, lightning hit a power line in Albuquerque, New Mexico. The strike caused a massive surge in the surrounding electrical grid, which in turn started a fire at a local plant owned by Royal Philips Electronics, N.V., damaging millions of microchips.

- Nokia Corp., a major customer of the plant, almost immediately began switching its chip orders to other Philips plants, as well as to other Japanese and American suppliers. Thanks to its multiple supplier strategy and responsiveness, Nokia's production suffered little during the crisis.

- In contrast, Telefon AB L.M. Ericsson, another mobile phone customer of the Philips plant, employed a Single sourcing policy. As a result, when the Philips plant shut down after the fire, Ericsson had no other source of microchips, which disrupted production for months. Ultimately, Ericsson lost $400 million in sales(Ericsson has since implemented new processes and tools for preventing such scenarios).

Best practices

Nokia vs Ericson



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