Supply Chain Risk Management (SCRM)

Managing risk in global supply chain networks

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Make or buy??

Single-sourcing vs multi-sourcing

Multi-sourcing is a powerful strategy to mitigate supply failure risk (2004 U.S. flu vaccine supply problem-vaccines' allocation)

Single sourcing:
Probability of occurrence: The number of potential risk sources is smaller for single sourcing (risk sources can be better recognized and be better proactively managed if applicable).
Damage: The possible damage in the case of single sourcing increases, because alternative sources are not available for strategic demand on a short-term basis.
Multiple sourcing:
Probability of occurrence: The probability that a risk occurs grows with the number of risk sources. The higher complexity of a large number of risk sources makes it more difficult for the supply manager to manage all risks.
Damage: Due to demand spreading to several suppliers, the damage of a disruption of one source is smaller in comparison to a single source.

Introduction

The last 15 years a reemergence of economic power across Southern and Southeast Asia, as well as in selected locations in Eastern Europe, South America, even Africa.

A series of events including the deregulation of trade, liberalization of foreign direct investment, and the development of Internet, have combined to “flatten” the world.

As a result of these forces, many Western-based manufacturing organizations found that it was possible to outsource activities, essentially splitting up work and sending individual operational pieces to far-flung locations.

Lower labor, land, raw materials and facility costs are the most commonly accepted reasons for global sourcing.

In addition to the possibility of lower costs, there are a number of benefits to be gained from global sourcing, such as access to new markets, better quality and higher flexibility.

Total Cost of Ownership (TCO) and Life Cycle Costing (LCC)

Total Cost of Ownership (TCO) vs. Cost Analysis

Introduction

Research program carried out by the Global Supply Chain Institute at the University of Tennessee, College of Business Administration (2014).

The research team distributed a questionnaire across a wide range of companies, including retailers, manufacturers and service providers (150 different supply chain executives).

For example, when companies analyze highly risky global outsourcing decisions, they fall into three categories:

- category one (36 percent): Consider unit cost plus transportation only
- category two (54 percent): Include in addition inventory as part of the
- assessment
- Category three (10 percent): Add a risk quantification and assessment.

90 percent of the firms *do not formally quantify risk when* sourcing production

Introduction

The consequences of not managing procurement risk effectively can include:

- discontinuity in the supply of essential goods or services,
- avoidable increases in project costs and in the unit costs of purchased inputs, in both the immediate and longer-term,
- loss of power and influence in relationships with essential suppliers,
- loss of market share or revenue through inability to meet customers demand,
- cash flow problems,
- procurement outcomes that do not support organizational needs and objectives, e.g. that undermine an organization's ability to respond with agility to changing circumstances,
- opportunity for fraud and corruption,
- negative impact on reputation in the market place,
- exposure of Directors and Officers to prosecution and litigation and
- failure in Corporate Governance and compliance controls.

Sourcing decisions in supply chain management

How do third parties increase the **supply chain surplus**:

1. Capacity aggregation
2. Inventory aggregation
3. Transportation aggregation by transportation intermediaries
4. Transportation aggregation by storage intermediaries
5. Warehousing aggregation
6. Procurement aggregation
7. Information aggregation
8. Receivables aggregation
9. Relationship aggregation
10. Lower cost and higher quality

Sourcing decisions in supply chain management

Supplier **scoring** and **assessment**:

1. Replenishment lead time
2. On-time performance
3. Supply flexibility
4. Delivery frequency/minimum lot size
5. Supply quality
6. Inbound transportation cost
7. Pricing terms
8. Information coordination capability
9. Design collaboration capability
10. Exchange rates, taxes and duties
11. Supplier viability

Sourcing decisions in supply chain management

Supplier selection: **auctions** and **negotiations**

Commonly used mechanisms for auctions:

1. Sealed-bid first-price auctions
2. English type auctions
3. Dutch auctions

Negotiations:

1. Terms of the contract
2. Win-win outcome

Sourcing decisions in supply chain management

Contract management:

1. Contracts for product availability and supply chain profits
   - Buyback or return contracts
   - Revenue sharing contracts
   - Quantity flexibility contracts
2. Contracts to coordinate supply chain costs (quantity discounts)
3. Contracts to increase agent effort (example for car dealers)
4. Contracts to induce performance improvement (shared-shavings)

Risk and sourcing decisions

Risks of using a third party:

1. The process is broken
2. Underestimation of the cost of coordination
3. Reduced customer/supplier contact
4. Loss of internal capability and growth in third-party power
5. Leakage of sensitive data and information
6. Ineffective contracts

Risk and sourcing decisions

Supply Cost Risk. The effective per-unit price that a firm pays can fluctuate over time due to variability in raw material prices and exchange rates, among other things. For example, Intercon Japan's connector manufacturer sourced a special type of bronze from a single metal supplier (Asahi Metal). This resulted in Intercon Japan having very little control over the raw material cost, and it, therefore, bore a significant risk of uncertain connector costs.

Supply Commitment Risk. Under a partnership agreement between Canon and Hewlett-Packard (HP), Canon has been the exclusive supplier of engines for the HP LaserJet printers. To keep supply costs down, the agreement dictated that HP place its order 6 months in advance and, furthermore, HP was not allowed to change the order quantity once the order was placed. This arrangement gave rise to a commitment risk for HP as it could not react to changes in demand by revising previously-placed orders.

Supply Continuity Risk. There are a number of risks (quality, labor unrest, etc.) that can interrupt supply for a short period of time. In April 2007, Ford temporarily closed 5 assembly plants in response to faulty transmission parts provided by a supplier but, according to a Ford spokesperson, they "certainly [did] not expect it to be a long period of time."

Risk and sourcing decisions

Benefits	
Lower costs	Fagan, 1991; Humphreys *et al.*, 1998; Liu *et al.*, 2008; Monczka and Morgan, 2000; Tsai *et al.*, 2008; Zeng, 2003
Greater access to new technologies and emerging markets	Ettlie and Sethuraman, 2002; Fagan, 1991; Monczka and Morgan, 2000; Trent and Monczka, 2003
Better quality	Ettlie and Sethuraman, 2002; Fagan, 1991; Humphreys *et al.*, 1998; Lowson, 2001; Monczka and Morgan, 2000; Trent and Monczka, 2003
Higher speed and flexibility	Ettlie and Sethuraman, 2002; Fagan, 1991; Humphreys *et al.*, 1998
Guaranteeing the availability of limited resources	Fagan, 1991
Introduction of competition to the domestic supplier base	Trent and Monczka, 2003
Improved political and regulatory environments in supply markets	Preston, 2004
Risks	
Decrease in net earnings from global sourcing due to the hidden costs	Braithwaite, 2003; Fagan, 1991;; Fitzgerald, 2005; James, 1990; Markides and Berg, 1988; Trent and Monczka, 2005; Tsai *et al.*, 2008
Supply disruption due to poor infrastructure and communication	Fitzgerald, 2005; Liu *et al.*, 2008; Tsai *et al.*, 2008
Quality problems	Braithwaite, 2003, Fitzgerald, 2005; Liu *et al.*, 2008; Tsai *et al.*, 2008
Longer lead times and higher working progress and safety inventory	Fagan, 1991; Fitzgerald, 2005; Levy, 1995; Markides and Berg, 1988
Increased transport	Fagan, 1991; Levy, 1995
Lower responsiveness and lost sales	Braithwaite, 2003; Markides and Berg, 1988
Loss of know-how	Braithwaite, 2003; James, 1990; Liu *et al.*, 2008; Markides and Berg, 1988; Tsai *et al.*, 2008
Uncertainty over the long-term impact on supply and demand	Braithwaite, 2003; Markides and Berg, 1988
Political instability and potential terrorist activities	Fagan, 1991; Fitzgerald, 2005; Liu *et al.*, 2008
Exchange rate fluctuations	Fagan, 1991; Liu *et al.*, 2008; Trent and Monczka, 2005
The difficulty of cross-functional and cross-locational coordination	James, 1990; Liu *et al.*, 2008; Markides and Berg, 1988; Trent and Monczka, 2005; Tsai *et al.*, 2008;
Cultural and time differences	James, 1990; Liu *et al.*, 2008; Trent and Monczka, 2005
Negative impact on sustainability, environmental risk and Corporate Social Responsibility (CSR)	Andersen and Skjoett-Larsen (2009); Ellegaard, 2008; Mollenkopf *et al.* (2010)
Increased rules and regulations	Trent and Monczka, 2005

Risk and sourcing decisions

Characteristic	Definition or Description
Cost reduction capabilities	The act of lowering the cost of the same goods or services.
Cycle time	The time between purchase request to a supplier and receipt.
Disasters	Any occurrence that causes great harm or calamity.
Environmental performance	Activities such as selecting materials used, product design processes, and process improvements.
Financial health of suppliers	Profitability trends in cash flow and the existence of financial guarantees.
Inbound transportation	Methods to distribute, handle, and transport inputs.
Information system compatibility and sophistication	Information system capability of suppliers to transfer timely, accurate, and relevant information to buyers.
Inventory management	Supplier ability to manage raw materials, work-in-process, and finished goods and inventories.
Legal liabilities	Legally enforceable restrictions or commitments relating to the use of the material, product, or service.

Risk and sourcing decisions

Characteristic	Definition or Description
Management vision	Supplier management attitude and ability to foresee market and industry changes.
Market price increases	Trends, events, or developments that may increase prices.
Number of available suppliers	The existence of monopoly or oligopoly conditions in the supply market.
Process technological changes	The frequency of new ideas and emerging technology.
Product design changes	The unpredictability of changes in product technology.
Quality	The ability of suppliers to conform to specifications.
Shipment quantity inaccuracies	The gap between the actual demand requests and the quantity shipped.
Supply availability	Availability of strategic materials in terms of quality and quantity, and the relative strength of suppliers.
Volume and mix requirements changes	Demand fluctuations in quantity and type for a component or service.

Source: Zsidisin (2003).

Managing sourcing risk

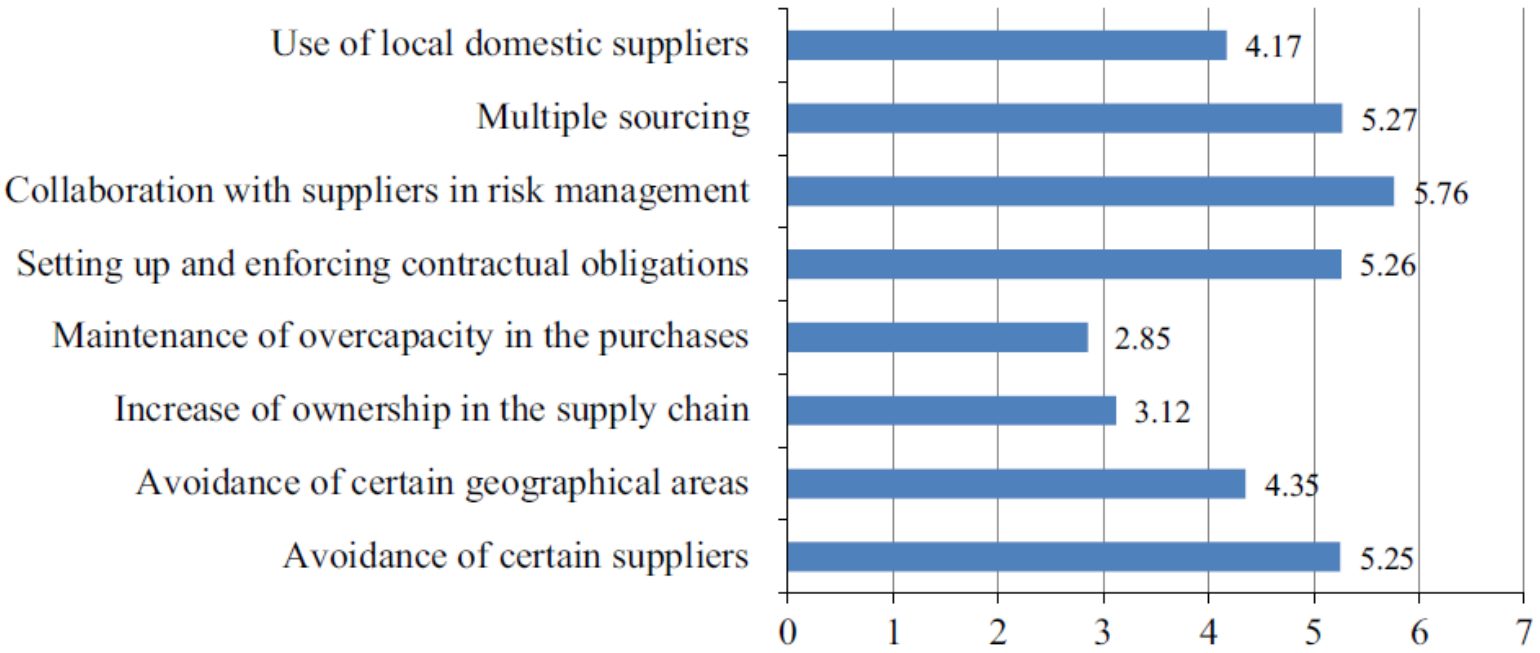
Firms can deploy a number of flexibility strategies to mitigate the negative impact of supply risks:

Flexible Supply Strategy via Multiple Suppliers. Firms that maintain an active set of **prequalified** suppliers for a given component can shift order quantities across these suppliers in response to variations in supplier costs. Clearly a firm has more supply flexibility as the number of suppliers increases but does it need a lot of suppliers, or just a few, to effectively mitigate supply cost risk? We note that a multiple-supplier strategy can mitigate routine supply continuity risk by enabling the firm to increase orders placed at other suppliers if one supplier suffers a short-term interruption.

Flexible Supply Strategy via Flexible Supply Contracts. As discussed above, HP faced a supply commitment risk because they were not allowed to revise their order quantity once submitted to Canon. To reduce HPs supply commitment risk, Canon agreed to offer HP some adjustment flexibility, that is, they allowed HP to adjust their order quantity upward or downward, but limited the adjustment to be no more than a few percent. This type of supply contract, one that specifies an upward/downward adjustment limit, is called a Quantity Flexible (QF) contract. QF contracts enable firms to mitigate their supply-commitment risk by shifting their order quantities across time.

Suppliers with multiple manufacturing sites at different locations, rather than just one site: The reason is that the risks associated with disruptions are minimized as supply can be shifted from one site to another.

Managing sourcing risk



Empirical survey (Hallikas and Lintukangas 2016)

Best practices

IBM's chief risk management officer's assignment is to implement and sustain an enterprise risk management process.

The goal is to ensure a world-class risk management process for each business unit.

With IBM's huge global outsourcing budget totaling tens of billions of dollars, with over 20,000 suppliers, its supply chain is complex, especially since some suppliers by necessity are sole-source suppliers.

Executing a global sourcing strategy where sourcing is conducted across developing countries (and with more than just first-tier suppliers) has a cumulative effect on the amount of risk introduced into the supply chain.

To manage risk, IBM's global sourcing process looks far beyond unit cost to the total cost picture. All of the dependencies are fully mapped, and whenever possible, backup sources are specified. The top risks are identified, along with their impact on the company's supply chain.

Best practices

Several years ago, IBM developed and patented its Total Risk Analysis (TRA) tool.

The need for this tool arose from the tremendous complexity of its supply chain, whose interactions went far beyond the ability of spreadsheets to comprehend. Initially IBM assumed a tool could be purchased, but the company quickly found that an acceptable option simply did not exist. The existing tools focused heavily on financial data modeling and fell far short of a comprehensive supply chain risk analysis.

IBM's TRA tool collects a multitude of data on many dimensions from 53 countries. Countries are further divided into logical economic entities. The tool filters risks into a critical few, showing **high-risk country–product–component combinations**.

Since it is important to avoid overwhelming the line organization, only the most important risks are surfaced for a required mitigation plan. In March 2011, the Japanese tsunami and earthquake placed the TRA tool front and center, and it responded flawlessly. Within a few hours, IBM determined all of its potential supplier problems, immediately assembled details, and developed backup plans.

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