RISK MANAGEMENT:
A TOP PRIORITY FOR SUPPLY CHAIN MANAGERS

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Abstract

In recent research by IBM, the Global Chief Supply Chain Officer Study [3], four hundred supply chain executives from organizations around the world were interviewed. The results of this research identified five major challenges for supply chain leaders:

- Cost containment
- Supply chain visibility
- Risk management
- Increasing customer demands, and
- Globalization

These five issues were identified as being "significant" or "very significant" in the way they impact companies' supply chains. This paper will focus on one of those challenges, risk management. We will review prior research to summarize the supply chain risks which have been identified and investigated. We will explore those primary supply chain risks further and discuss potential measures for reducing, mitigating and managing those risks.

Introduction

First we briefly explain the nature of supply chains and supply chain management. One source describes a supply chain or supply network as being composed of "different entities that are connected by the physical flow of materials" [6]. While the material flow is the motivation for designing a supply chain, other flows are naturally inherent in a supply chain. Information flow and financial flow are the other necessary elements to describe the full spectrum of supply chain flows.

The following definition for "supply chain management" (SCM) offers a succinct description of the critical elements:
"Supply chain management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders" [9].

From these descriptions we might surmise that significant risks will be associated with material (or product) flows and also with information flows. That means that the various supply chain linkages are potential sources of risk which may affect the material and information flows. The financial flow is also subject to risk which may take many forms such as exchange rate issues, credit worthiness of supply chain partners, and a variety of other issues.

In the following section we review a sample of the literature which focuses on supply chain risk. The literature selected is primarily from the most recent ten year period. We don't see this as a bias but rather a product of the state of research on this topic.

Literature Review

Common sources of supply chain risk which have been investigated in previous research include: location, logistics, order processing, purchasing, quality, supply lead time, supply availability, and demand [4][2][10].

A previous review by Tang [15] has listed and discussed the following sources of supply chain risk:

- Uncertain demand
- Uncertain supply yields
- Uncertain lead times
- Uncertain supply capacity
- Uncertain supply cost
- Uncertain price

The research also presents a series of "robust strategies for mitigating operational and disruption risks" [15].

Another publication suggests that risks take many forms including: – financial, "chaos", decision, and market risks [4]. The authors suggest that these risks result from a "lack of supply chain confidence" and that specifically there is a lack of confidence in the following supply chain elements:

- Order cycle time
- Order current status
- Demand forecasts given
- Suppliers' capability to deliver
- Manufacturing capacity
- Quality of the products
- Transportation reliability
- Services delivered [4].

The authors offer the following approaches to reduce risk. Risk can be mitigated by improving information access with greater accuracy and greater visibility throughout the supply chain. The basics of statistical process control can be used to identify "out-of-control" conditions in the supply chain and to provide alerts. Contingency plans and corrective actions can be provided to supply chain partners to achieve a more responsive, adaptive supply chain [4].

Mason-Jones and Towill [12] offer a generic model of supply chain uncertainty which is divided into four segments:

- Supply side
- Manufacturing process
- Demand side, and
- Control systems [12].

Clearly, the authors have included elements in this model which are consistent with a very broad view of risk.

In a very different approach to risk, Finch [7] investigated the size of supply chain partners as a factor that may increase risk for the buying firm in the relationship. His findings affirm the need for performing risk assessments and the need to exercise caution when selecting supply chain partners [7].

In a recent IBM study, 400 supply chain leaders were surveyed. Five major supply chain challenges were identified. Based solely on percentages, the top challenges are:

- Supply chain visibility (70% of respondents)
- Risk management (60%)
- Increasing customer demands (56%)
- Cost containment (55%), and
- Globalization (43%) [3].

When listed by priority the rankings change slightly. 'Cost containment' moves to the top position followed in order as listed below:

- Cost containment
- Supply chain visibility
- Risk management
- Increasing customer demands
- Globalization [3].

In either case, risk is prominently in the forefront of the minds of supply chain executives. "CFOs are not the only senior executives urgently concerned about risk; risk management ranks remarkably high on the supply chain agenda as well" [3].

These examples are a good representation of the ways that supply chain risk has been described in the literature. In particular it is a good representation of how risk has been broken into various elements related to supply chain management. In many of the examples, the dominant focus is on the risk that affects product flow. The full range of examples also indicates a growing concern for supply chain risk over the last ten years. These examples from the literature offer one perspective but in the next section we review some company examples.

Company Perspectives

There appears to be a dichotomy in the experiences and the approaches to supply chain risk management among companies. Some companies have gone through major supply chain disruptions resulting from a specific event and from that experience they have learned the importance of risk management. Other companies have smartly and proactively developed their plans to deal with potential supply chain risks and have executed those plans effectively when needed.

In the first group we can list Cisco Systems and Ericsson. In 2000, Cisco found themselves stuck with huge inventories after anticipating a certain demand level and then facing a significant decrease in market demand [5]. In 2000, Ericsson had a significant supply chain reduction due to a small fire at a supplier's factory [11]. In both of these cases the company was ill prepared and suffered a major disruption and/or significant additional costs. Ericsson's subsequent efforts for risk management have been documented by Norman and Jansson [13].

In the second group, Nokia and Publix Super Markets serve as examples. Nokia utilized the same supplier as Ericsson as mentioned above [11]. The difference is that Nokia had a contingency plan in the form of a backup supplier. The contingency plan is one example which indicates that Nokia did have a more realistic view of supply risks [11]. Publix Supermarkets is one of the companies listed among the AMR Top 25 Supply Chains for 2007 [1]. As described by AMR in summary comments about Publix, "Proactive disaster preparedness strategies hint at the

sophistication of its strategic thinking" [1]. The absence of major disruptions for both of these companies is the strongest evidence of their planning and consideration of supply chain risks.

There are some other excellent examples of companies and their approach to supply chain risks as shown in the following Table:

Table 1. Company Examples

Company	Issue(s)	Enabler	Author(s)
Benetton	Visibility and controls	EDI network	Christopher & Lee, 2004
Adaptec	Market risks and loss of market share	Internet technology	Christopher & Lee, 2004
Sainsbury (UK)	Access to POS data	Extranet	Christopher & Lee, 2004
Nokia	Respond to supplier disruption	Contingency planning & implementation team	Lee 2004

Additional companies have joined the ranks of companies in recent years that have adopted risk management practices to address a portion of their supply chain risks. Among these we would include Flextronics, Solectron and 3Com [11]. Cisco [11] and Ericsson [13] have also joined the list after learning from their painful supply chain experiences.

The following Table will further summarize and synthesize the views of risk presented in the literature:

Table 2. Views of Risk from Literature

View of Risk	Suggested Approach	Author(s)
Many forms – financial, "chaos", decision, and market risks OR "lack of supply chain confidence"	Increase supply chain confidence through "end-to-end visibility"	Christopher & Lee, 2004
Uncertain times, quantities and performance.	Robust strategies for supply, demand, product and information management	Tang, 2006
The risk elements are categorized as: supply, demand, the operation and the controls.	Enriched supply chain information pipeline	Mason-Jones & Towill, 1998
Do large companies increase their risk by partnering with small and medium size companies for critical supply chain elements	Risk assessment and planning for business continuity	Finch, 2004

Strategies for Risk Management

The strategies that we have extracted from the literature include "robust strategies" to deal with supply chain risk [15]. As suggested by Tang [15], strategies are needed to address supply management, demand management, product management, and information management.

Demand shifting, postponement, and collaborative forecasting are just a few examples of the more detailed strategies that emerge from those categories [15].

Another strategy involves utilizing technology and better communication to improve "end-to-end visibility" as a way to reduce uncertainty and risk [4]. Developing agility and doing so not as a single company but spreading the agile practices throughout the supply chain in an effort to synchronize the entire supply chain is another major strategy from Christopher and Lee [4].

These are just a few example strategies and we can see the main focus that dominates these perspectives. "Clearly not all supply chain risk is created through a lack of confidence amongst supply chain members" [4]. This leads us to a different view of supply chain risk as discussed in the following section.

Proposed Approach to Risk

Many of these strategies are focused on one specific aspect of SCM. We recommend that a more comprehensive view of risk and a broader range of strategies need to be developed to mitigate all forms of risk. We also share the concern of Stauffer [14] that supply chain managers may focus on large risks with low probability of occurrence while paying little attention to smaller risks which are very likely to occur.

In an effort to develop a more comprehensive view of supply chain risk we have used a combination of different perspectives. This leads us to a proposed framework as shown in the headings for the following Table:

Table 3. Proposed Framework

Risk Categories	High impact risk	Frequency for High	Low impact risk	Frequency for Low
Material flow				
Information flow				
Financial flow				
Relationships (relational flow)				

The four categories are taken from the "four supply chains" as published in Inside Supply Management in 2002 [16]. This framework affords a much broader view of risk and covers much more territory in the decision space that makes up the full spectrum of the supply chain. We envision that a company can utilize this framework to guide scenario analysis and strategic planning efforts to assess supply chain risk. At this stage this is a very preliminary proposed framework. Additional development work and a possible case study example are needed to flesh out the ideas in greater detail.

Future Research

Research about supply chain risk is growing but it is still in the "infancy" stage. Jüttner made a similar remark about the "infancy" of both "supply chain vulnerability" and "supply chain risk management" [8]. Given the "infancy" state of this research stream there are many topics that need to be investigated. Craighead et.al. [6] represent one of the more recent research efforts but they focus on actual disruptive events rather than the planning for a broad spectrum of risks as we suggest. From our earlier discussions we advocate that a more comprehensive view of risk needs to be taken in the course of research and also in the course of application. Taking our proposed framework further to evaluate the practicality and usefulness is the next logical step to follow.

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