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Aligning supply chain design for boosting resilience

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Abstract Many researchers have analyzed the effect of disruptive events, such as natural disasters and economic and market forces, on global supply chains. However, there is a lack of consensus on delineating a universal collection of supply chain risk management practices that will help companies operate in a global market with large-scale disruptions. In this article, we present an analysis, in conjunction with a worldwide online survey, based on successful global brands and their supply chains. We propose a framework that deploys the dynamics of building supply chain resilience, first linking the design of the supply chain portfolio (local versus global scope, as well as strategic responsiveness versus cost reduction) with supply chain vulnerabilities (external versus internal). We describe the transition between different supply chain structures as a way of coping with disruptions and thus proactively developing resilience. In this article, we introduce both a supply chain risk management approach and the reactive-by-deployment mode, as illustrated by successful global company examples.

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1. Supply chain risk management

Supply chain risk management received international attention in the aftermath of the September 11 terror attacks, when disruptions in the transportation system revealed the fragility of companies that relied on just-in-time practices and offshore production (Sheffi, 2015). In particular, supply chain

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risk management became a much-needed research topic after Hurricane Katrina in 2005, the Japanese earthquake and tsunami in 2011, and most recently, the horrific fire in a clothing factory in Bangladesh, which caused serious disruptions to the global supply chain. Currently, we are facing more such disruptions. For example, closed-border policies due to international immigration tensions, terrorist attacks that limit freight transportation, and problems resulting from high-impact political situations such as the U.K.'s Brexit are all disruptive events that restrict international trade. Apart from the humanitarian and social effects, these types of events are revealing the vulnerability of value networks.

Such disparities illustrate that many companies need a solid and holistic strategy to respond adequately to large-scale disruptions. One of the most worrisome conclusions that can be drawn from these recent major events is that most firms ignore or fail to recognize high-impact risks. Moreover, even among companies that recognize such risks, many neglect to assess the potential impact in sufficient detail and cannot respond accordingly. Many managers continue to struggle to create contingency rules and procedures for complex, dynamic, and high-risk business situations. In this regard, the MIT Scale Network study reported that approximately 60% of managers do not actively engage in supply chain risk management or simply consider such actions as ineffective (Saenz & Revilla, 2014).

Consequently, one of the objectives of this article is to answer this question: Why, despite our accumulated knowledge of dealing with disasters and companies' extensive experience in building and running global market supply chains, do so many enterprises still struggle to cope with large-scale disruptions?

In our view, one answer is that risk management is still a relatively new discipline in the supply chain management field. A lack of quick wins to provide momentum to efforts has resulted in a lack of effective managerial guidance in developing a framework when deploying risk management practices and selecting the best supply chain structures and associated strategies. Additionally, this article addresses another important question: How can companies cope with these disruptive events and build resilience while minimally impacting their value chain?

The main contribution of this article is to analyze the dynamics of reactive and proactive risk management to create resilience in supply chains through a holistic vision that begins when companies initially design a product and its supply chain.

We propose that companies should first analyze their competitive strategies in terms of market competition and develop their different supply chains accordingly without losing sight of the assumed risks. Companies might require a supply chain based on cost reduction versus responsiveness. As such, local and global suppliers must be an integral part of company plans and scenarios given our current trend of globalization. A thorough understanding of the sources of vulnerabilities is also essential. Companies must be able to develop and implement the most effective risk management tools for their particular supply chains. We have proposed a closed-loop framework that integrates the close relationships between supply chain design and building resilience in a dynamic setting that can be used by any enterprise regardless of operation area.

We also analyzed and contrasted the most relevant risk management orientations with the practices that successful companies use regarding supply chain risk management. Our innovative framework integrates proactive and reactive risk management and uses robust tools and best practices from companies whose supply chain risk management has been tested during major disruptions. Proactive risk management should be rooted by design to provide resilience in products and corresponding supply chains. At the same time, such efforts should be integrated with reactive risk management tools deployed and customized according to the specific disruptive episode.

This article is structured as follows. We start by introducing the framework that tackles the dynamics of building supply chain resilience. We then deploy each sequence of steps, illustrated with relevant and practical examples from companies. We examine the main characteristics for structuring and designing a supply chain and their implications for levels of vulnerabilities. We illustrate four different supply chain scenarios, briefly reviewing existing best practices of well-known companies in the supply chain arena. A description of proactive and reactive supply chain risk management follows. We describe how a proactive approach provides the feedback connection with the origin of supply chain design. In the Appendix, we present our research methodology.

2. Dynamic supply chain design: The origin and the end

Companies adopt supply chains based on an industry's idiosyncrasies. A deep understanding of why supply chains are designed in a given way helps

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