

Supply Chain Risk Management

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Editor

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Advanced Tools, Models, and Developments

 Springer

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Preface

Supply chains today are vulnerable to disruptions with a significant impact on firms' business and performance. The aim of supply chain risk management is to identify the potential sources of risks and implement appropriate actions in order to mitigate supply chain disruptions.

This book presents a set of models, frameworks, strategies, and analyses that are essential for managing supply chain risks. It contributes by combining theoretical findings and research results with a practical and contemporary view on how companies can manage the supply chain risks and disruptions, as well as how to create a resilience supply chain. The book provides the state-of-the-art developments in managing supply chain risks from various perspectives. It can be used as an essential source for students and scholars who are interested in pursuing research or teaching courses in the rapidly growing area of supply chain risk management. It also provides an interesting and informative read for managers and practitioners who need to deepen their knowledge on effective supply chain risk management.

Structured in a modular fashion, each chapter in this book introduces and analyzes a specific topic on supply chain risk management, allowing readers to identify the chapters that relate to their interests. More specifically, the book is presented in three sections: (1) supply chain risk management, (2) supply chain vulnerability and disruptions management, and (3) toward a resilient supply chain.

The first two sections of the book focus on risk and disruption management in supply chains that provide related concepts, tools, and newly developed models, while the third section focuses on resiliency in supply chains and a firm's ability to return to its original state after a disruption occurs.

In Chap. 1, Zohreh Khojasteh-Ghamari and Takashi Irohara present a comprehensive review on supply chain risk management, and investigate recent research developments in the field. They summarize previous review papers in the field of supply chain risk management, followed by reviewing the recently published related works. Also, they develop a framework to categorize those papers, and present the observed pattern of the research in supply chain risk management. In Chap. 2, Abroon Qazi, John Quigley and Alex Dickson address the decision problem of ranking supply chain risk mitigation strategies and introduce a new

method for prioritizing those strategies based on associated cost and effectiveness. They develop a framework using Bayesian Belief Networks and demonstrate its application via numerical experiments. The proposed framework can help managers and practitioners select a best combination of strategies considering the efforts involved in implementing and managing such strategies. In Chap. 3, Kristian Rotaru and Mehrdokht Pournader develop a model for risk emergence and propagation in buyer–supplier–customer relationships and identify and formalize the structural and relational patterns. They categorize the identified generic patterns reflecting the emergence and propagation of potential adverse events and behaviors within buyer–supplier–customer service triads into a comprehensive typology. By an example, they illustrate how the methodological approach underlying the proposed typology facilitates risk assessment in service triads and service networks.

Chapters 4 and 5 focus on managing specific types of risks in supply chains that have not been addressed widely in the literature. In Chap. 4, Fred Lemke and Henry Petersen address reputational risks in supply chains. They discuss the nature of reputation and the related risks involved in a supply chain setting from a practical point of view by pointing out that the understanding, identifying, and mitigating reputational risks are considered as a key management task. They emphasize on corporate social responsibility as a mitigation strategy for reputational risks. In Chap. 5, Barbara Gaudenzi and Giorgia Siciliano focus on information technology and cyber risks in supply chains. They describe the potential impact of information technology and cyber risks on the continuity and vulnerabilities of a supply chain. They propose a theoretical framework that may guide managers to perceive, control, assess, and manage those risks within the supply chain. The proposed framework explores how systematic information technology and cyber risk management may enhance the ability to share information and better manage supply chain processes.

Chapter 6 presents an overview of supply chain risk management by focusing on Japanese companies. In this chapter, I first describe the different types of potential risks in supply chains, and then provide some examples of disruptions in Japanese supply chains caused by the Great East Japan earthquake in 2011. I also outline some strategies and developments on how to mitigate supply chain disruptions in case of a natural disaster. Finally, I introduce a supply chain risk management software developed by Fujitsu.

The second section of the book continues on managing supply chain risks by focusing on vulnerability and disruption management. Jyri Vilko and Lauri Lättilä begin the section with a chapter that analyzes supply chain vulnerability through simulation. They present a conceptual framework to examine the feasibility of using simulation methods for analyzing supply chain vulnerability. They develop and test a discrete event simulation model to reduce the overall vulnerability, and show how it can be used to gain a more holistic view of supply chain vulnerability. In the next chapter (Chap. 8) Amit Sonar and Cameron MacKenzie use a dynamic model to measure the supply chain disruptions preparedness. They analyze different disruption scenarios by considering the impacts of disruptions at a supplier, the firm's production facility, and a firm's warehouse. They use Wagner–Whitin model to

solve the optimal ordering strategy for each type of disruption. Chapter 9 analyzes market response when a disruption occurs in the supply chain. In this chapter, Arun Vinayak and Cameron MacKenzie develop a quantitative model that represents the way the customer or marketplace reacts to a supply chain disruption. They analytically interpret the impact of different customer behaviors in such conditions on the firm's post-disruption performance.

In Chap. 10, Artur Swierczek develops a framework for risk management in supply chains that aims at mitigating negative consequences of the transmission and amplification of disruptions. The framework includes identification of potential and actual disruptions, estimation of disruptions, evaluation of the most appropriate approach to deal with those disruptions, and the application of the mitigating strategy. In Chap. 11, Prasanna Venkatesan and Mark Goh address strategic sourcing issue under supply disruption risk. They present a mixed integer linear programming model for supplier selection and order quantity allocation for the suppliers. By applying the particle swarm optimization technique, the model minimizes the expected total cost which includes supplier management cost, raw material purchase cost, and expected supplier loss. In Chap. 12 the last chapter of this section, Yasutaka Kainuma presents a model that considers disruption risk in designing and evaluating global supply chains. He addresses an important issue in supply chain risk management since disruptions caused by natural disasters have become a serious problem in global supply chains. A mathematical model is developed with the objective function of maximizing total profit, and several key factors are considered and discussed.

The last section in the book focuses on supply chain resiliency which represents the ability of a firm to return to its original state, within an acceptable period of time, after a disruption occurs. The first chapter of the section provides a broad overview of the field of supply chain resiliency. In this chapter, Srinivasan Radhakrishnan, Benjamin Harris, and Sagar Kamarthi discuss different components that contribute to the resiliency of a supply chain. The chapter also outlines processes that are used for building resilient supply chains, and provides a unifying exploration of the various aspects and perspectives on supply chain engineering, including how they can be utilized for developing and measuring the resiliency of a supply chain. In Chap. 14, Anirban Ganguly, Debdeep Chatterjee, and Harish Rao discuss the critical phases and attributes of a resilient supply chain along with discussing important supply chain resiliency strategies. They highlight the advantages of a resilient supply chain through insightful examples from a range of industries, and discuss how firms can react effectively to negative effects of disruptions.

In Chap. 15, Sigurd Pettersen, Bjørn Asbjørnslett, and Stein Erikstad present a methodology for designing resilient service supply chains by combining system design methods with methods from risk assessment. The proposed methodology provides decision supports by reducing the vulnerabilities of the service supply chains through design actions that can increase overall supply chain resilience. In Chap. 16, Arash Azadegan and Jayanth Jayaram develop a conceptual model for resilience in supply chains using systems theory and the family resilience model.

They identify a series of organizational characteristics that combine to form supply chain resilience. Their developed model shows the inter-relationship among the building blocks of supply chain resilience as well as how they can enhance response and recovery in the case of supply chain disruptions.

In Chap. 17, Michael Braunscheidel and Nallan Suresh focus on the cultivation of supply chain agility as a risk management initiative that enables a firm to anticipate and respond rapidly to marketplace changes and disruptions in the supply chain. They propose a set of supply chain initiatives as antecedents for cultivation of agility, and identify drivers for cultivating agility in the supply chain. By conducting an empirical study, they provide a set of managerial practices as a guideline to address the cultivation of agility for both mitigation and response. In the last chapter of the book, Paolo Trucco, Boris Petrenj, and Seyoum Eshetu Birkie address resilience improvement in key resources supply chains by focusing on assessing the impact of critical infrastructure disruptions on the supply chain, the economic losses caused, and the potential effectiveness of different strategies. They use a multilevel modeling approach by combining discrete event simulation and system dynamics, and assess the economic loss impact of disruptions in critical infrastructure systems and the potential effectiveness of different strategies to improve resilience in the supply chain.

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I would also like to thank my wife Miya and sons Nima and Yuma for allowing me to devote the time necessary to complete this book. I dedicate this book to them.

Tokyo, Japan
July 2017

Yacob Khojasteh

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