Supplier Segmentation Method for Selection of Resilience-Enabling Procurement Strategies

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Abstract

Supply chain exposure to disruptions often increases because of strategic choices made to improve other objectives like cost or lead time. Performance trade-offs resulting from strategic choices can be assessed using simulation, but a complete analysis is difficult to perform due to the extensiveness of many supply chains and the limited availability of management resources. A reliable, resource-efficient tool is needed for selecting the best procurement strategy for each supplier, given the existing sourcing environment. Supplier segmentation is a tool used to identify procurement strategies for groups of suppliers with similar needs. However, the existing methods of segmentation focus on strategy selection during normal operating conditions, and do not consider the effects of the chosen strategy during periods of disruption. In this work, a case study is introduced representing a global supply chain for a laser printer. The system is examined using agent-based modeling and simulation with the objective of measuring the effects of strategic variables on the resilience of the supply chain, given a set of external conditions. As the results are developed, a segmentation guideline will be derived whereby the best strategy for resilience for any supplier can be identified given knowledge of the external conditions.

Keywords
Supplier Segmentation, Supply Chain Resilience, Agent Based Modeling and Simulation, Supply Chain Disruption

1. Introduction

Resilience has been defined by Ponomarov and Holcomb [1] as 'the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function.' As summarized from Wagner and Bode [2] a disruption is an unintended and anomalous event resulting in an exceptional situation that significantly threatens the course of normal business operations.

The study of methods to increase supply chain resilience against disruptions has emerged as an important topic due in part to the continuation of such trends as increasing globalization, decreasing length of product life-cycles, and increasing demand for efficient, low-inventory supply chains [1, 3, 4]. While these trends are brought about by the efforts of organizations to gain competitive advantage, they may at the same time increase the supply chain's vulnerability to disruptions. Evidence supports the continued relevance of resilience as a topic in supply chain management. Each year, the Business Continuity Institute (BCI) conducts a survey on supply chain resilience. The report from 2014 indicates both an increasing frequency and severity of disruption incidents among respondents [5]. Despite the trend of increasing disruptions, the survey indicates that management commitment to supply chain resilience has not risen to meet the need.

With continued pressure for companies to drive down operating costs, investments to increase resilience will need strong justification requiring increased understanding of trade-offs between different management strategies. It becomes pertinent to reveal strategies capable of adding resilience against disruption without increasing the cost of day-to-day operations. Simulation studies can be performed to conduct such trade-off analysis. However, these studies are resource intensive and are difficult to complete when the scope of the supply chain study is very large.

Supplier segmentation is a comparably resource-efficient method that can be used to specify appropriate management strategies by grouping suppliers into segments with similar needs. Similar procurement strategies can be formulated and applied to the suppliers in each segment, thereby removing the need to develop a fully-tailored procurement strategy for each individual supplier. In this way, management resources are efficiently allocated