

DECISION SCIENCES INSTITUTE
Toward a Typology of Organizational Responses to Significant Man-made Supply Chain
Disruptions

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ABSTRACT

How companies effectively and efficiently respond to supply chain disruptions is discussed extensively in the extant literature. However, how companies respond to man-made disruptions remains an unexplored area of research. In this study, we propose a typology of possible organizational responses to man-made supply chain disruptions.

Key words: Supply chain disruptions, crisis management, man-made supply chain disruptions, typology

GM North America Output at Risk by Supplier Bankruptcy

Automotive News (2016)

INTRODUCTION

Globalization has made the risk of supply chain disruptions a reality for businesses. There is a considerable discussion in the literature and reports in the various media outlets of how some companies failed to respond to disruptions in their supply chains and how these disruptions negatively impacted the companies' performance. A recent bankruptcy filing by one of General Motors' (GM) major suppliers nearly forced the abrupt closing of 19 GM assembly plants which would have led to millions of dollars in losses (Gleason, 2016). A small fire at a Philips, NV microchip manufacturing plant in Albuquerque, N.M., resulted in reshaping of the market for two of Europe's biggest electronics companies – Nokia and Ericsson (Latour, 2001). Recently, Takata filed for bankruptcy protection after mounting legal claims made it almost impossible for the company to continue operations. The company was facing estimated liabilities of \$10-\$50

billion because it was forced to recall millions of airbags sold to automobile manufacturers. Some of these airbags had deployed inadvertently injuring and sometimes killing drivers (Soble, 2017).

What these news stories demonstrate is that companies, across various industries, are subject to supply chain disruptions. How companies effectively and efficiently respond to supply chain disruptions is discussed at varying levels of analysis in the extant literature (see Craighead et al., 2007; Snyder et al., 2006). However, how companies respond to man-made disruptions remains an unexplored area of research. This study seeks to fill that gap. Some companies are better able to respond to a supply chain disruption because managers may engage in boundary-spanning (Plenert et al., 2012). While it is accepted that all supply chains are inherently risky (Craighead et al. 2007), it is also known that exceptional planning by companies can mitigate, if not eliminate completely, the risk to their operations and financial viability (Plenert et al. 2012; Snyder et al 2006).

The extant literature focuses on natural disasters or emergency events e.g. an earthquake in Japan, the Indian Ocean Tsunami, the SARS outbreak and other similar disasters and how those events impact supply chains (see Adegoke and Gopalakrishnan, 2009). These events are especially costly. Although the United Nations Office for Disaster and Risk Reduction (UNISDR) reported that “average annual loss from disasters is estimated to increase from USD 260 billion in 2015 to USD 414 billion by 2030” (Wahlstrom, 2015), there are no publicly available records detailing the costs of man-made supply chain disruptions. While considerable discussion of supply chain disruptions in the literature (Qi et al., 2000; Kleindorfer & Saad, 2005; Craighead et al. 2007; Schmidt, 2015), we still have a limited understanding of man-made supply chain disruptions.

In this study, we will address the question: Do companies respond differently to man-made supply chain disruptions? We utilize Plenert et al.’s (2012) five areas of disruptions: (1) Supply failure; (2) Manufacturing operations failure; (3) Logistics failure; (4) Information and technology failure; and (5) Workforce unavailability to identify man-made supply chain disruptions.

The purpose of this paper, by utilizing an archival research approach, is to develop a typology of organizational responses to man-made supply chain disruptions. The model will specify the predictive qualitative responses of firms to the various man-made disruptions of four companies in four different industries: automobile; consumer goods; toys and games; and consumer electronics. This study makes an important contribution to the literature and to our understanding of the relationship between man-made supply chain disruptions and firm responses. Firms that utilize our typology are less likely to experience significant harm to their reputations and are also less likely to suffer significant negative financial performance. This study is also important to practitioners in the field to mitigate the risks of man-made disruptions and provide a mechanism on how to respond once a disruption occurs.

The structure of this paper is as follows. First, we provide a review of the literature on supply chain disruptions. Second, we discuss the theoretical and methodological framework. Finally, we conclude with a discussion of the implication of the typology on firms facing supply chain disruptions.

LITERATURE REVIEW

A company's supply chain and its ability to manage that supply chain conveys a measure of competitive advantage to the firm (Hendricks and Singhal, 2003). The ability to engage in the most cost-effective sourcing and then deliver the right finished product to the right consumers at the right price gives that firm competitive advantage in the market. It is commonly repeated by practitioners in the field that companies do not compete, but their supply chains do. They claim that a company that manages its supply chain efficiently and effectively will gain a competitive advantage over its rivals. It is assumed that if these companies are seeking a competitive advantage experience some disruption, the companies can mitigate the disruption to such a degree to limit financial losses. Yet, a review of the literature seems to indicate that companies are almost always experiencing some form of disruption and are also experiencing significant financial losses (Craighead, et al., 2007; Hendricks and Singhal, 2003, 2005a, 2005b; Natarajarathinam et al., 2009; Schimidt, 2015).

There are significant differences between human-induced and natural disasters. The most obvious difference between the two types of disasters is that man-made disasters are within a company's control. This does not include man-made earthquakes which are the cumulative results of human actions. Natural disasters are outside the company's control. Another distinction between these two types of disasters is the level of coordination required. Natural disasters require significant coordination with government agencies and other affected businesses as well as significant communication and consensus. It has been advanced in the literature that the public generally reacts more negatively to the effects of human-induced crises than to natural disasters (Pearson & Mitroff, 1993). This is evidenced, for example, from the public's response to the Mattel supply chain crisis. The company was accused of producing toys which were coated with lead paint.

Much of the literature on supply chain disruptions has focused on natural disasters and emergency events. Snyder et al. (2006) list several notable events: Hurricanes Katrina and Rita in 2005 on the U.S. Gulf Coast crippled the nation's oil refining capacity and destroyed large inventories of coffee and lumber and forced the rerouting of bananas and other fresh produce. An eight-minute fire at a Phillips semiconductor plant in 2001 brought one customer, Ericsson, to a virtual standstill. There have been some notable man-made disasters as well. A strike at two General Motors parts plants in 1998 led to the shutdowns of 26 assembly plants, which ultimately resulted in a production loss of over 500,000 vehicles and an \$809 million quarterly loss for the company. There is also some literature e.g. (Wowak and Boone, 2015) on product recalls and their disruptive impact on firms' supply chains. We argue that the disruptive nature of recalls occurs in the firm's reverse supply chain operations and do not address recalls any

further in this paper. Of course, natural disasters and extreme weather conditions are not the only threats to supply chains (Culp, 2013).

Information asymmetries may be the cause of some disruptions in a firm's supply chain. A firm's suppliers possess greater information about their operations, especially with defective or unshipped goods or equipment, than the buying firm. How can a firm mitigate or eliminate such disruptions? Greater transparency would certainly mitigate some of these problems. However, how can the buying firm incentivize the supplying firm to provide information or materials in a timely manner? Information sharing reduces problems in the supply chain. When information is distributed evenly between principals and agents, agency problems are less likely to arise (Rutherford et al., 2007).

A supply chain – or more accurately, a supply network – is comprised of different entities that are connected by the physical flow of materials (Craighead et al., 2007). These different entities, generically referred to as nodes in graph lexicon, are involved in the conversion, the logistics (i.e., warehousing, transportation and so on), or the selling of materials (i.e., raw materials, work in progress, and finished goods), with the materials reaching final customers in some desired form and quantity (Craighead et al., 2007). The various nodes in supply networks present various kinds of risks for companies in that network.

It is evident that the repercussions of supply chain disruptions to the financial health of a company can be far-reaching and devastating (Hendricks and Singhal, 2005). Supply chain disruptions and the associated operational and financial risks represent the most pressing concerns facing firms that compete in today's global marketplace (Craighead et al., 2007). The business press and much of the extant research literature is replete with numerous discussions on the market's response to a company's missed earnings projections, missed launch of a new product, recall of a defective product or any other such crisis. These types of disruptions can have disastrous consequences for the buying public.

How a firm responds to a disruption is emblematic of its structure and strategy. Mitroff, et al. (1989) raised an interesting question when they asked, "Do (some) organizations cause their own disruptions?" This is not a rhetorical question. It can be the subject of empirical investigation. Though not the subject of this paper, Mitroff's (1989) question does aid in our understanding of how a company's behavior can make it either "disruption-prone" or "disruption-prepared." The authors developed a model which is based on four characteristics of how companies could respond to a disruption: (1) core beliefs; (2) organizational beliefs; (3) organizational structure, and (4) organizational behavior (Shaluf, 2003). Managers who are more aware of the internal and external factors that impact a disruption can more effectively respond and recover when there is a disruption in their operations (Macdonald and Corsi, 2013). The authors list several possible causes of supply chain disruptions: poor communication between suppliers and manufactures, opportunism by suppliers, strikes by truck drivers or port workers, acts of terrorism, information technology (IT) malfunctions, industrial accidents, quality problems, natural disasters and government regulations. The vast majority of these disruptions are man-made.

Disruption Matrix

We utilize Grundel's (2005) crisis matrix to distill the four companies we have selected and the types of disruption experienced by each company. He distinguished four types of crises: conventional crisis, unexpected crises, intractable crises, and fundamental crisis. *Conventional disruptions* are located in the first quadrant. They are predictable and the influence possibilities are well known. *Unexpected disruptions* are located in the second quadrant and are compared to conventional disruptions. These types of disruptions are hard to predict but easy to influence. *Intractable disruptions* can be anticipated sufficiently but interference is almost impossible. These disruptions are can be predicted but are not influenceable. The Mattel and Samsung disruptions, for example, can be considered intractable disruptions. Fundamental disruptions are located in the fourth quadrant and represent the most dangerous class of disruptions due to the fact that they are neither predictable nor susceptible to risk.

THEORETICAL DEVELOPMENT

Theory

Firm structure and strategy are important factors in how a firm responds to a disruption. In this paper, we develop a theoretical framework supported by a typology (Zott, 2003) for how firms can respond to man-made supply chain disruptions. We reviewed several theoretical perspectives including the resource-based view (RBV) of the firm (Barney, 1991; Wernerfelt, 1984) and its derivatives dynamic capabilities (Eisenhardt and Martin, 2000; Teece et al., 1997), managerial capabilities (Adner and Helfat, 2003), and punctuated equilibrium theory (Gersick, 1991; Tushman & Romanelli, 1985;) for our initial discussion of firms' strategic responses to supply chain disruptions.

Penrose (1959) viewed the firm as a collection of productive resources (Cf. Hoskisson, 1999). A firm's resources at a given time could be defined as those (tangible and intangible) assets which are tied semi- permanently to the firm (Wernerfelt, 1984). We view a firm's supply chain as an intangible asset which conveys competitive advantage to that firm (Barney, 1991). Firms can achieve sustained competitive if other firms are unable to duplicate their strategy. Indeed, purchasing and supply chain management can, at least in some settings, be sources of competitive advantage for a firm (Barney, 2012).

A firm's supply chain is certainly a unique capability. It is not a tradable commodity or easily imitated process. And, it does enable a company to respond to changing market conditions. In short, a well-designed and efficient and agile supply chain is a dynamic capability (Teece et al.1997). Eisenhardt and Martin (2000) echo Teece et al. (1997) perspective on dynamic capabilities viewing them as the antecedent organizational and strategic routines by which managers alter their resource base – acquire and shed resources, integrate them together, and recombine them - to generate new value creating strategies. Managing an agile and efficient supply chain is certainly a functional competence not easily imitated. However, the

Dynamic Capability literature is silent on how dynamically capable firms respond to man-made supply chain disruptions.

Building on the work of Schmalensee (1985) and Rumelt (1991) discussing industry and firm effects and whether corporate, i.e. business effects, give firms a competitive advantage, Adner and Helfat (2003) argued that the managerial effects explains the variance in firms' performance across industries. We argue that a firm's supply chain, if it is well designed, efficient and agile, is a major factor in the variance of firms' performance across industries. However, while both Dynamic Capabilities and Dynamic Management Capabilities offer explanations for organizational utilization of their resources neither fully explore or explain organizational responses to man-made supply chain disruptions.

Firms seek some semblance of stasis in their operations particularly in their supply chains (Tushman and Romanelli, 1985). Disruptions affect the normal flow of operations. Companies are becoming more aware of man-made disasters and their effects of supply chains (Munim et al., 2015). Having a robust supply chain strategy can make a firm more resilient to disruptions (Tang, 2006). These strategies generally pertain to natural disasters, not man-made events.

Building Theory from Archival Data

In discussing the various ways to operationalize business-level strategy, Hambrick (1980) argued that some researchers have viewed strategy as a situational art that can best be studied through in-depth case studies. He continued that another approach is through strategic typologies. In this paper, we utilize archival data, applying the methodology developed by Miles and Snow (1978: 4) to develop our framework. Our aim is to, through a comparative analysis of the data we have obtained, devise a framework of company responses to man-made supply chain disruptions.

Developing theory from archival data is not novel. Researchers such as Ravasi and Rekom (2003), Schultz and Hatch (2005), Gupta et al, (2006), and Shah and Corley (2006) have contributed to the evolution of archival theory building research. Sometimes is not possible to collect field or case study data because of various constraints. In such instances researchers are permitted to utilize existing sources of information including consumer reports and other published materials (Gupta et al., 2006). Theory building requires a richness that only qualitative methods can provide. A deeper understanding of a phenomenon is only possible through the interpretations of that phenomenon from experiencing it (Shah and Corley, 2006). We recognize that "data doesn't generate theory – only researchers do that" Mintzberg (1979). Researchers can develop theory from examining the practical knowledge of practitioners (Schultz and Hatch, 2005). We argue that utilizing archival data to build theory is consistent with the foregoing logic.

We selected a company for our analysis if it met one or all of the following criteria: (1) The disruption was widely reported in the news media; (2) The disruption had a significant

impact on the company's operation as measured by consumers' response to the company; the market's response to the company and the regulatory response to the company; (3) The disruption had a national or global impact; and (4) The disruption had adverse public consequences.

How Companies Respond to Disruptions

We apply Miles and Snow's (1978) framework for how companies can respond to supply chain disruptions. *Defenders*, who respond to a problem in the following manner: Plan -> Act -> Evaluate. Defenders tend to be myopic in their supply chain operations. They tend to seek sole source agreements to maintain access to resources and to limit competition (Miles et al., 1978). *Prospectors*, who respond to a problem in the following manner: Evaluate -> Act -> Plan. Prospectors tend to be more innovative. They tend to enjoy flexibility and always seek to locate new areas of opportunity (Miles et al., 1978). *Analyzers* who are in a traditional business respond in the following manner: Plan -> Act -> Evaluate; and Evaluate -> Plan -> Act when launching a new product. Analyzers enjoy the flexibility of Prospectors, but seek to minimize risks to their continued operations. Finally, there are Reactors, who as the name implies, merely react to a situation. The fire at the Philips Manufacturing facility in Albuquerque, NM is an example of managers reacting to a situation. There is a causal chain to the fire. The lightning strike knocked out power to the plant. However, because the company did not have back-up generators to run the fans in the clean room which caused the overheating which sparked the fire.

In our survey of the literature, only Van Wassenhove (2006, p. 476) provides a definition of 'man-made disasters.' However, the definition is limited in scope to humanitarian operations which addressed "sudden onset disasters, such as terrorist attacks or a coup d'état." Some of these disasters can be slow-onset such as a political or refugee crisis. Another example of a slow-onset disaster is Mattel's failure to monitor its suppliers' use of banned lead paint in its toy manufacturing processes which led to a massive recall of some of the company's toys at the height of the pre-Christmas shipping season. We employ Behdani et al. (2012) "Pre-Disruption" and "Post-Disruption" and "Proactive" (Predictive) vs. "Reactive" classification system which follows a "time perspective" to conduct my analysis of how firms respond to various types of disruptions. This classification system utilizes aspects of Miles and Snow, (1978) typology. We share Snyder et al.'s (2006) contention that there is evidence that superior contingency planning can significantly mitigate the effect of a disruption. Companies that engage in pre-disruption behaviors are likely to engage in risk management strategies. Companies that respond to a disruption are likely to pursue disruption management strategies (Behdani et al., 2012). The risk management literature abounds with strategies for responding to supply chain pre-disruptions (Kleindorfer and Saad, 2005; Manuj and Mentzer, 2008; Wiendhal et al., 2008; Matook et al., 2009). However, there is scant literature on post-disruption management. There is, of course, considerable literature on crisis management (Adhitya et al., 2007; Blackhurst et al., 2005). Since the purpose of this study is to examine how firms respond to man-made disruptions, we limit our investigation to post-disruption management.

Disruptive Events Used in the Study

We use the following events to conduct our analysis: Samsung and its response to the Galaxy Note 7 disruption; GM and its response to one of its major suppliers filing for bankruptcy and the ensuing disruption to GM's operations; and automakers' response to auto safety equipment manufacturer Takata filing for bankruptcy. These cases span across different industries but all involve consumer goods.

Samsung and the Galaxy Note 7

On August 3, 2016 Samsung launched the Galaxy Note 7 (Samuelson, 2016). Within a month of the launch, and shortly after Samsung launched the Note 7 in China, the company received reports of some of its phones bursting into flames (Samuelson, 2016). The alleged cause of the phones bursting into flames was due to the battery overheating. Samsung utilized two suppliers for its batteries: a subsidiary of the company and a Chinese supplier, Amperex Technology. In response to the reports, Samsung informed consumers to charge the phone to 60% rather than charging it fully (Lee, 2016). The problem persisted and Samsung began offering cash incentives of \$25 to who had purchased a Note 7 to switch to another Samsung device rather than a rival product (Curtis, 2016). In a September 11th, news report, Samsung urged consumers to stop using the Galaxy Note 7 and recalled 2.5 million units. The Consumer Product Safety Commission (CPSC) urged consumers to turn off the phones and leave them off. The CPSC ruling allowed the Federal Aviation Administration (FAA) to issue a ban on the Note 7 on domestic airlines (Gibbs, 2016; Mastroianni, 2016). Several other countries, e.g. Dubai and Scandinavia, had already banned the Galaxy 7 from their airlines (Gibbs 2016).

In a September 20th news report, Samsung claimed that its investigation did not find a problem with the battery (Jeong, 2016). Officials at Amperex argued that the problem was not with the battery they supplied since they also supplied batteries to Apple. They used the same battery in the phones launched in China that are used in Apple's iPhones. Officials at Samsung were still unsure of the cause of the problem (Jeong, 2016). In early October, Samsung halted production of the Galaxy Note 7 and began offering refunds to consumers. The company's shares fell eight percent. Samsung, in its third quarter reporting, posted a net profit of \$87.9 million. The company's reporting for the same period last year was \$2.1 billion (Mozur, 2016).

Takata Defective Airbags and Bankruptcy Filing

On June 25, 2017, Takata Americas, an arm of the automotive safety systems manufacturer, Takata Kojo, filed for bankruptcy protection in Delaware (Chetsas, 2017). Takata manufactured airbags which were installed in over 125 million cars – most of them in the United States. The company's airbags were linked to more than a dozen deaths and over 150 injuries in the U.S. (Radu, 2017). These injuries or fatalities and the resulting lawsuits of the automobile manufacturers eventually forced those companies to seek compensation from the airbag manufacturer – Takata. The mounting costs – the company was ordered to pay \$25 in

restitution funds, \$125 million to individual victims and \$850 million for damages to automakers – Takata to seek bankruptcy protection (Radu, 2017).

Takata is not the largest manufacturer of airbags though it is presumed to be the cheapest (Lewis, 2017). It is speculated that the automakers that installed the defective, e.g. Honda, Toyota, Ford and BMW, knew about the defects but in a cost cutting move installed the cheaper airbags with disastrous consequences (Lewis, 2017; Shepardson, 2017). Of course, it is evident that cutting costs actually cut some lives short. The bankruptcy filing and the ensuing litigation against Takata has revealed some interesting aspects of the buyer-supplier relationship. Apparently, automakers are financing the recall process with money they already owed to Takata to mitigate future lawsuits against them (Lewis, 2017). What these series of events at Takata and the automakers reveal is the degree to which internal decisions to initiate and exacerbate man-made supply chain disruptions.

Mattel Toys

In the summer of 2007, Mattel, the world's largest toymaker announced the biggest recall in its history (Story and Barboza, 2007). The recall was linked to two separate incidences – (a) toys covered in lead paint and (b) toys made with small magnets that, if swallowed, would harm children. This recall had come on the heels of another recall the company had announced earlier in the year. Mattel's CEO, Robert A. Eckert, acknowledging that the company could have more recalls, stated that "no system is perfect" (Story and Barboza, 2007). The company's senior vice president of worldwide quality assurance, stated that "we do realize the need for increased vigilance, increased surveillance" (Story and Barboza, 2007). After the initial reporting, the market did not punish Mattel. In an August 15th, 2007 news report, Mattel's share price had fallen by only 57 cents to \$23.00 (Casey and Zamiska, 2007). The company took out a full page advertisement to parents pledging to be more vigilant in its inspections and engaged in other efforts to assure concerned parents. Mattel also took full responsibility for the recall and apologized to the Chinese government once it was discovered that not all of the tainted toys had been manufactured in China.

In response to the various recalls, several U.S. senators, Mark Pryor and Daniel Inouye sponsored legislation to overhaul the Consumer Protection Safety Commission and provide more protection for imported children toys. "Mattel announced plans to upgrade its safety system by certifying suppliers and increasing the frequency of random, unannounced inspections" (Casey and Zamiska, 2007).

General Motors (GM)

General Motors filed an injunction in a court in Massachusetts, to prevent its sole supplier of interior parts, from pursuing bankruptcy protection (Gardner, 2016). The company, Clark-Cutler-McDermott Co. (CCM), filed for bankruptcy protection claiming that its contract with the automaker resulted in a loss of approximately \$30,000 per month. In its court filings, attorneys for GM stated, "A continued disruption in the supply chain of component parts will also cause a

catastrophic disruption in the supply chain of the operations of countless GM suppliers, dealers, customers, and other stakeholders, including the potential layoffs of tens of thousands of workers in the event GM's North American operations are completely shut down" (Gleason, 2016). GM and CCM were able to resolve the dispute in an agreement which permitted GM 'to purchase equipment and inventory that the automaker said it must have to avoid any production operations' (Gleason, 2016).

PROPOSED MODEL

The responses of the companies in the cases in this study ranged from efficient and effective to deficient and defective. Nokia was aware of the disruption before they were notified by the supplier because the company carefully monitored its supply chain. After suffering a significant financial loss from a previous disruption, the company's senior executives created a "crisis response team" to anticipate a disruption; activate secondary suppliers and achieve stability. It is apparent that the organizational structure, plays a critical role in a company's successful handling of a disruption. The point articulated by Plenert et al. (2012) about a company's ability to detect and act swiftly on a disruption bears repeating. While these events cannot be predicted with precise accuracy, their major impacts can be narrowed down to one of five areas: (1) Supply failure; (2) Manufacturing Operations failure; (3) Logistics failure; (4) Information and technology failure; and (5) Workforce unavailability. The four cases in my study have experienced one or all the following failures: (1) Supply failure; (2) Manufacturing Operations failure; (3) Logistics failure; and (4) Information and technology failure. None of the companies in our study suffered a man-made disruption because of workforce unavailability.

We agree with Mitroff et al. (1989) that a company's behavior can make it either "crisis-prone" or "crisis-prepared." Only one company in our survey, Nokia, was adequately prepared for the crisis when it occurred. Applying Mitroff et al.'s (1989) model which is based on four characteristics of how companies could respond to a crisis: (1) core beliefs; (2) organizational beliefs; (3) organizational structure, and (4) organizational behavior, we posit the following propositions.

Propositions

Proposition 1: *Following a major supply chain crisis, companies that combine symbolic and substantive responses will perform better than those that pursue a piecemeal approach*

Proposition 2: *When a supply chain crisis has extensive magnitude and high external visibility, companies that respond with a "strategic/systemic overhaul" strategy will perform better.*

Proposition 3: *When a supply chain crisis has extensive magnitude and low external visibility, organizations that respond with an "operational overhaul" strategy will perform better.*

Proposition 4: *When a supply chain crisis has limited magnitude and low external visibility, organizations that respond with "fine tuning" actions will perform better.*

Proposition 5: *When a supply chain crisis has limited magnitude and high external visibility, companies that respond with “symbolic” actions will perform better.*

DISCUSSION AND IMPLICATIONS

This paper sought to address the problem of organizational responses to man-made supply chain disruptions. Some companies are better able to detect a disruption and implement a strategy to mitigate the disruption (Plenert, et al., 2012). While much of the literature focuses on natural disasters or other types of emergencies, the results of our research show that man-made disruptions can significantly impact a company’s operations, its reputation and ultimately, its performance. However, since these events are man-made, there are man-made solutions to the problems. Some companies can indeed mitigate, if not eliminate, man-made disruptions. Companies that engage in Fine Tuning, i.e. Tweaking, can verify suppliers, review their internal processes; review replenishment policies; review safety inventory levels or evaluate cycle times. Companies that take a Symbolic approach can, in addition to Fine Tuning activities, install and Enterprise Resource System (ERP) such as a Vendor Management System or a Transportation Management System. Companies that engage in an Operational/Process Overhaul can, in addition to Fine Tuning or a Symbolic approach, may hire a Supply Chain Manager to oversee their supply chain operations. Finally, companies that engage in a Strategic/Systemic Overhaul, i.e. change the companies’ strategies may hire managers with specific Supply Chain Management experience; engage in frequent exchange of personnel between suppliers and buyers; implement collaborative forecasting and planning with others in the supply chain; and improve information visibility and accuracy (Chopra and Meindhl, 2013). Companies that engage in a Strategic/Systemic Overhaul may also retain Board members with Supply Chain Management experience. Altay and Green (2006) with their four phases of disaster operations management: (1) mitigation, (2) preparedness, (3) response, and (4) recovery; offer an additional perspective to analyze how each company in the study responded to its supply chain disruption. It is evident from our survey that only one company met all the criteria: Nokia. The question before us now is are these results replicable to other companies? This can be the subject of future research. Nokia, demonstrated that discrete management of its supply chain, and open information within the company and with its suppliers are effective mechanisms to mitigating a supply chain disruption

It was clear that Nokia was more “crisis-prepared” than any of the other companies we reviewed for this paper. Preparation was part of the company’s core and organizational beliefs to share information across different business units as well as with its supply partners. This transparency paid dividends Nokia which became aware of the disruption before; Philips, its supplier, notified the company of the disruption. The company “encouraged bad news to travel fast, and it didn’t want to hide problems.” Given the number of recalls Mattel experienced during its disruption, it is evident that the company was “crisis-prone”.

One factor not addressed in this study, but that may prove significant in further studies is the role of prior experience with supply chain disruptions. Nokia maintained a crisis management team because the company have experienced a significant supply chain disruption and the CEO had vowed never to be caught unawares again. To our knowledge, none of the other companies in the study, all of which had experienced some prior disruptions, changed their behavior. How well does information flow within these “failing” organizations is a matter of some interest.

Implications for Practitioners

This study demonstrates that practitioners who are interested in mitigating or eliminating supply chain disruptions should consider one or all of the following approaches: (1) hiring a senior level manager, i.e. a Chief Supply Chain Officer to monitor its supply chain operations; multi-sourcing; (2). hiring a risk manager to better assess risk; (3). sharing information with its suppliers; and (4). sharing information within the company. If what is currently discussed in the practitioner press that “companies do not compete, but their supply chains do” holds, then it is incumbent on senior managers to begin evaluating their staff and developing the talent to make their supply chains competitive. Mattel, has gone so far as to develop a training program for supply chain talent. The company is hiring college grads from supply chain or business programs in the hopes of molding them into leaders down the line (Wall Street Journal, 2015). A recent study of 400 executives by Deloitte Consulting LLP found that 71% had difficulty recruiting senior leadership. This lack of talent at the lower and upper management levels directly impact companies’ performance and reputation. This talent shortage can make companies vulnerable to more catastrophic man-made supply chain crises.

LIMITATIONS AND FUTURE RESEARCH

Although this study offers a significant contribution to our understanding of how companies can respond to man-made supply chain disruptions, it does not address several critical areas. We did not investigate the decision-making process of the top management team (TMT). Are companies with board members with supply chain experience less likely to experience a man-made supply chain disruption? And, if that company experiences a supply chain disruption, given its board resources, is it able to mitigate the effects of the crisis? Future research can address these questions. Further, this study did not consider companies’ prior experience with a supply chain disruption and how it responded to a new crisis. In short, did the company learn anything from its past experience? In this study, it is apparent, that Nokia learned from it prior bad experience, but GM did not. This requires an understanding of the senior management decision-making process. This study was limited to man-made supply chain disruptions. Further, not all the companies were in the same industry. Therefore, we are not able to determine the extent to which companies in the same industry differ in their strategy, structure and processes (Miles and Snow, 1978 p. 4).

CONCLUSION

Supply chains are inherently risky. That risk can grow exponentially as companies source more globally. It seems evident the the level of risk in a supply chain is proportionate the the distance in the process from production to consumption. That seems like a particularly daunting picture. From my study, it appears that companies can successfully mitigate the disruption risk but engaging in proactive and consistent monitoring behaviors. As Nokia demonstrated, having a crisis management team, with an individual responsible for overseeing supply chain operations is an essential first step to managing a crisis if there is a disruption. Further, empowering managers and allowing for the free flow of information is also critical to successfully managing a supply chain disruption.

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