

# Leadership For Mitigating Ripple Effects in Supply Chain Disruptions: A Paradoxical Role



Iana Shaheen, Arash Azadegan, Robert Hooker and Lorenzo Lucianetti

**Abstract** For leadership, responding to supply chain disruptions can be paradoxical. Supply chain disruptions can rattle the stability and operational norms of a company and its stakeholders. Without an unwavering effort to contain the damage, such disruptions can easily propagate and become even more damaging. This assertion suggests that decisive leadership is fit for the purpose. However, supply chain disruptions often sever multiple value-generating streams, creating a ripple effect across organizations. Re-establishing production links in a web of inter-organizational exchanges requires careful examination of what is at stake by purchasing and supply managers. This alternative assertion suggests that an adaptive leader is fit for the purpose. The concurrent need for decisiveness in leadership and adaptiveness in leadership can be paradoxical. In this study, we explore this issue by assessing how leader's adaptive decision-making (ADM) affects the extent of operational performance damage caused by different forms of supply chain disruptions. Using paradox and leadership theories, we offer hypotheses related to unexpected, complicated and enduring supply chain disruptions. We empirically test our hypotheses using secondary (financial) and primary (managerial assessment) data from a cross-section of 251 manufacturing firms. Results show a concave curvilinear relationship between leader's ADM and operational damage from supply chain disruptions, suggesting that moderate levels of ADM are optimal. Higher ADM is particularly effective to diminish ripple effects in the face of rare disruptions. Instead, low ADM is more effective in the face of unexpected and complicated disruptions.

---

I. Shaheen (✉) · R. Hooker  
University of South Florida Tampa, Tampa, Florida, USA  
e-mail: [ianalukina@usf.edu](mailto:ianalukina@usf.edu)

A. Azadegan  
Rutgers Business School New Brunswick, Piscataway Township, New Jersey, USA

L. Lucianetti  
University of Chieti and Pescara, Pescara, Italy

© Springer Nature Switzerland AG 2019  
D. Ivanov et al. (eds.), *Handbook of Ripple Effects in the Supply Chain*,  
International Series in Operations Research & Management Science 276,  
[https://doi.org/10.1007/978-3-030-14302-2\\_5](https://doi.org/10.1007/978-3-030-14302-2_5)

## 1 Introduction

Disruptions have the ability to cause notable damage to a supply chain. As of late, supply chain disruptions have become seemingly more commonplace (Bode and Wagner 2015). Today's globally interconnected, time-sensitive, and efficiency focused operations set the stage for disruptions to disperse and affect multiple entities (Brandon et al. 2014; Ivanov et al. 2014). Disruptions may significantly impact the supply management function, because failures in handling the disruption in one company can easily spill-over effects to others (Sokolov et al. 2016). The "ripple" is characterized by disruption's cascading effect downstream, impacting supply chain performance (Dolgui et al. 2018). UPS Capital Report 2014 survey shows that more than half of the surveyed firms had suppliers who could not continue supplying within a reasonable time frame if they suffered a disaster in one location (Dittmann 2014). These factors place pressure on supply chain executives. While unforgiving to poor decisions, supply chain supply chain disruptions require the short-order assembly of resources alongside prudent decisions to prevent the disruption from further propagation and to re-establish organizational norms. By definition, supply chain disruptions create unstructured, vague, and urgent dilemmas for leaders and arise from the intricate interactions among suppliers that make supply chains more vulnerable (Azadegan and Jayaram 2018; MacDonald and Corsi 2013; Wagner and Bode 2006).

Leadership plays a critical role in addressing supply chain disruptions. The business scene is replete with cases where an unwavering leader organized resources, directed efforts, and motivated members to rally in front of disruptive events (Howell and Shea 2006). In contrast, the absence of a decisive leader has led to mismanagement of response and recovery efforts and caused further disorganization and damage (Shaw and Goda 2004). Some believe that errors and omissions by leaders are the second major source of harmful outcomes during disruptions (Dynes et al. 1981).

It is unclear as to how leaders are best to deal with supply chain disruptions. Contrasting leadership approaches have been shown to be effective in the face of similar disruptions. For example, consider the now classic case of responding to a major product recall by Johnson and Johnson. James Burke, the company's chairman, made a decisive move to replace the entire stock of Tylenol tablets off of the market. This bold move costs more than \$100 million but saved the company's reputation and potentially many lives (Prokesh 1986). Burke was widely admired for his "take charge" leadership style. This contrasts with how PepsiCo's CEO, Craig Weatherup, addressed a similar product contamination crisis. In 1993, reports from several sources surfaced that syringes had been found in cans of Diet Pepsi. Instead of jumping in with a reflexive response to recall products, Weatherup pulled company executives together and formed a crisis response team to carefully analyze all potential means for foreign objects to enter the production stream across the value chain (Novak 2009). This thorough and prudent assessment allowed him to appear on national TV with visual evidence that cast heavy doubts on the legitimacy of the reported cases.

Leadership in the face of supply chain disruptions can be challenging. On the one hand, there is need for decisiveness in action to effectively contain the situation (Shaheen et al. 2017; Eisenstat et al. 2008). A strong and unbending leader that can set the agenda and enforce strict protocols seems well suited for the purpose (Özgelik and Cenkci 2014). Indeed, crisis managers have often been recognized because they confidently “took charge” and unwaveringly led the organization (James and Wooten 2005; Yukl 2005). On the other hand, supply chain disruptions can be ambiguous and complicated. Given the tangled and complex nature of supply chains, leaders must carefully consider pertinent facts, intricacies of the issues, and potential ramifications of their decisions. Like Weatherup, leaders are often admired because of their considerate and adaptive approach in such settings.

Whether decisiveness or adaptiveness is more effective for a leader facing supply chain disruptions is unclear. Whereas decisiveness relates to uncompromising sternness on one’s attitude and the manner in approaching a disruption, adaptiveness implies flexibility in decision-making by considering multiple views. We explore this tension by delving into how a leader’s adaptive decision-making (ADM) affects the outcome of various types of supply chain disruptions. ADM is the leader’s capacity to adjust thoughts and behaviors so as to enact appropriate responses to evolving situations (Hannah et al. 2013). In this perspective, we consider ADM as a continuum ranging from leader decisiveness (i.e., a resolute and stern leader) to leader adaptiveness (i.e., a flexible and integrative leader). We ask: How does a leader ADM help (or hinder) response and recovery efforts in the face of different forms of supply chain disruptions? We leverage theories in paradox and leadership to explain how leadership can be effective in the face of supply chain disruptions.

## 2 Leadership and Supply Chain Disruptions—A Literature Review

By now, it is well established that supply chain disruptions can be challenging and harmful (Hendricks and Singhal 2003). However, not all of such disruptions cause the same level of harm, nor they do create the same type of challenge for leaders (Ketchen et al. 2014). A review of the literature suggests that among the primary differentiators of supply chain disruptions is the extent to which they are (i) unexpected (ii) complicated, and (iii) rare (Craighead et al. 2007). Unexpected supply chain disruptions are those that happen without pre-warning or act unpredictably as they unfold (Cunha et al. 2006). Unexpected supply chain disruptions are challenging because they leave no preparation time to collect information or to prepare for the ensuing damage (Ansoff 1975). For instance, General Motors management had a 30-minute alert before a tornado touched down on their plant in Oklahoma City causing extensive damage to the paint shop, body shop, and powerhouse (Sheffi and Rice 2005). Complicated disruptions are those that sever numerous value adding streams across organizations. The great Japan Tsunami of 2011 was quite complicated for the auto

industry as it affected a multitude of parts suppliers and manufacturers while simultaneously severed transportation and distribution links (Park et al. 2013). Finally, rare supply chain disruptions are unique in the sense of offering no past experience that parallels them such that the firm can draw lessons from (Lampel et al. 2009). This lack of familiarity lowers the organization's confidence in their ability to effectively deal with the situation. For example, the West Coast Port slowdown in 2015 was a rare disruption, creating issues for companies not prepared to deal with the long-term impact of being left without access to Californian ports of entry (Soergel 2016). In the remainder of the manuscript, we delve in-to how these different forms of supply chain disruptions affect organizations and how leadership can address them.

Table 1 provides a selective group of literature about leadership as explored in related streams. This literature review suggests that there is a diversion in interpretation between crisis management and supply chain management literature. Whereas the former group highlights leader's resolute decision making to address the crisis (i.e., decisiveness), the latter emphasizes the need to be prudent and to recognize the intricacies of the supply system through analytical thinking and integration (i.e., adaptiveness). Rooted in disaster studies, crisis and humanitarian research views addressing the needs of human victims as a principal objective of leadership. Instead, rooted in operations management, supply chain research views the restoration of production systems as an essential responsibility for the leader. As interpreted by supply chains researchers, an effective leader not only addresses the needs of any potential victim (e.g., an employee, consumer, or supplier personnel), but also is responsible for alleviating the bottom line financial or reputational effects of the supply chain disruption.

The dichotomy between leader decisiveness and adaptiveness becomes more confounding as supply chain disruptions become more challenging. Earlier we explained how challenging disruptions come in (a) unexpected, (b) complicated, and (c) enduring forms. Supply chain disruptions become even more difficult as they take on one or more of these forms. In the next section, we explore how such paradoxical phenomena can be explained. We then offer hypotheses on how leader ADM can be effective in facing disruptions with different characteristics.

### **3 Theory—Supply Chain Disruptions as Paradox and Leadership ADM**

Paradox involves the simultaneous presence of contradictory and mutually exclusive elements (Poole and Van de Ven 1989). The common features of supply chain disruptions—urgency, ambiguity, and high stakes—also severely constrain the leader's ability to assess information and make decisions effectively (Pearson and Clair 1998). This creates consternations for the leader. As Dutton (1986) notes, it may be impossible to achieve a full understanding of the nature, underlying reasons, and conse-

**Table 1** Key findings from crisis leadership and supply chain leadership literature

Crisis leadership literature		Emphasis on	
Authors (year)	Key findings	Decisiveness	Prudence
House (1971)	A decisive decision making style is important in leadership contexts	I	
Mulder et al. (1971)	Naval officers with directive and autocratic capabilities are more effective during emergency situations	I	
Roberts and Bradley (1988)	During crisis, the charismatic leadership provides only limited results	I	
Pillai and Meindl (1998)	Employees' perceptions of crisis management were negatively related to charismatic leadership		I
Hunt et al. (1999)	During a crisis, crisis-responsive charismatic leaders are important	I	
Shenkman (2000)	One of the qualities of a great president during crisis is decisiveness and quick response	I	
James and Wooten (2005)	Effective crisis leadership involves the leaders' ability to make wise and rapid decisions	I	
Yukl (2005)	Strong and decisive leadership appears to be especially important when crisis exists	I	
Van Wassenhove (2006)	When facing a humanitarian crisis, leaders often need to take actions quickly	I	
Ginter et al. (2006)	When responding to crisis, high reliability team need to have clear and decisive leaderships	I	
Cavanaugh et al. (2008)	As the damage cause by disruption grows, the need for a decisive and determined leader grows	I	
Peterson and Van Fleet (2008)	Nonprofit firms prefer leaders to use directive behavior over supportive behavior in a crisis	I	

(continued)

**Table 1** (continued)

Crisis leadership literature		Emphasis on	
Authors (year)	Key findings	Decisiveness	Prudence
Tatham and Kovács (2010)	An effective crisis manager needs to emphasize immediate results and decisiveness over inclusiveness	I	
Bechky and Okhuysen (2011)	During emergencies, SWAT team officers are required to reinforce task activities, and make timely decisions	I	
Van Wart et al. (2011)	Decisiveness is one of the top two competencies for emergency managers	I	
Stern (2013)	Leaders need to make crucial decisions in a timely fashion under difficult conditions	I	
DuBrin (2014)	Directive and decisive leaders are generally successful in extreme contexts	I	
Haddon et al. (2015)	During financial crisis, employees expect leaders to take actions quickly and provide rapid response	I	
Supply chain leadership literature			I
Spekman et al. (1998)	Supply chain managers' trust and commitment contribute to performance as the elements of collaboration		I
Gammelgaard and Larson 2001	Listening/team work are the top skills for supply chain leaders, while performance under pressure is lower in ranking		I
Harvey and Richey (2001)	Analytical, Practical, and Creative Intelligence are key capabilities for global supply chain manager		I
Parker and Anderson (2002)	Supply chain manager should be an integrator who coordinates activities from product concept to delivery across firm		I
van Hoek et al. 2002	Supply chain managers need to concentrate on self-motivation and adaptability toward the change		I

(continued)

**Table 1** (continued)

Crisis leadership literature		Emphasis on	
Authors (year)	Key findings	Decisiveness	Prudence
Williams et al. (2002)	In eSC, autocratic/participative leaders are ineffective. Instead, transformational leader is cost effective		I
Mangan and Christopher (2005)	The key skills for supply chain manager included analytical, interpersonal, leadership and change management		I
Richey et al. (2006)	Supply chain managers with high adaptability can drive firm competitive advantage and performance		I
Hult et al. (2007)	Transformational leadership has a stronger relationship than transactional leadership on outcomes	I	
Defee et al. 2009	Transformational supply chain leaders showed higher performance by incorporating the behaviors of all supply chain members	I	
Fawcett et al (2010)	Supply chain manager needs to not only understand the key supply chain functions, but also keep them rolling in synch		I
Cousins et al. (2006)	Supply chain managers need to acquire strategic skills that add value and enable effective alignment with business		I
Youn et al. (2012)	Integrative leadership with shared goals improves intangible and value-based supply chain performance goals		I
Overstreet et al. (2013)	Positive relationship between transformational leadership and organizational performance	I	
Ellinger et al. (2013)	Managing changes and complexities and providing leadership are fundamental to the success of supply chain managers		I

(continued)

**Table 1** (continued)

Crisis leadership literature		Emphasis on	
Authors (year)	Key findings	Decisiveness	Prudence
Essex et al. (2016)	Supply chain manager needs to fully understand the processes of reconfiguration, integration and learning		I
Wilson and Barbat (2015)	Supply chain manager is a relationship manager who is employed to resolve problems and create value		I
Ambulkar et al. (2016)	Supply chain managers should have a greater level of ability to acquire, disseminate, and integrate external knowledge		I
Shou and Wang (2017)	Supply chain manager competences include generic/functional skills, SCM qualifications, expertise, and industry skills		I

quences involved in a crisis. Nevertheless, the high stakes involved require the leader to generate the best course of action.

One way to work through contradictions is to separate the tensions by splitting the explanations (Poole and Van de Ven 1989). For instance, if “a” and “b” are antithetical, one should first focus on explaining “a”, and then on “b” to enable a more workable certainty (Lewis 2000). By examining them separately, new perspectives may emerge which can help generate a meaning that could accommodate contradictions (Lüscher and Lewis 2008).

We base our analysis on adaptive decision making (ADM), a leadership trait that helps capture the observed dichotomy (Bauer et al. 2013; Payne et al. 1993). ADM is a leader’s capability to adjust thoughts and behaviors so as to enact appropriate responses to evolving situations (Hannah et al. 2013). Leaders who apply ADM emphasize seeking different views, re-examining their assumptions, and considering new ways of looking at problems. There are trade-offs to ADM (Payne et al. 1993). Extensive ADM can lead to better quality decisions, at the expense of more comprehensive selection process, which can be taxing on leadership and on firm resources. Instead, limited ADM can lead to exacting and unyielding decisions that make them easier to follow and implement. Management literature has investigated the effectiveness of ADM (e.g., Bauer et al. 2013). However, whether ADM can be helpful in the face of crises or supply chain disruptions is unclear. The section below explains the effect of ADM in more detail.

### 3.1 Leader ADM and Supply Chain Disruptions

There is evidence in support of both leadership decisiveness and adaptiveness in facing crises (Lukina et al. 2017; Dooley and Lichtenstein 2008). For instance, in support of decisiveness, Eisenstadt et al. (2008) explain how uncompromising managers, that refuse to lower their expectations, are able to lead their companies through difficult situations. Jim Collins, in his highly acclaimed book “Good to Great”, argues for a leader’s fierce resolve as a key ingredient to enhance company performance (Collins 2005). In support of adaptiveness, Heifetz et al. (2009) suggest that leaders can be effective by recognizing and incorporating input from employees. Yukl and Mahsud (2010) suggest that success in facing external crises requires collective learning and collaboration by many members of the organization. Crisis leaders that can encourage and facilitate these processes can be more effective

At first glance, these two perspectives sound contrary. However, a more careful assessment of the literature suggests that the concern may be in *extensive* use of either decisiveness or adaptiveness. To start, crises occur under high stress, high stakes conditions where response efforts need to be definitive so as to leave no doubt on how to take action (Boin and Lagadec 2000). Resources need to be applied in a precise manner to ward off the crisis from spreading and to avoid wasted effort. Too much emphasis on adaptiveness (i.e., on gathering input and seeking different views) can take away from taking action and lead to “paralysis through analysis.” There are also strong organizational pressures that work against too much contemplation over alternative courses of action. For instance, there may be heavy concerns over the potential for further damage caused by the disruption or other secondary “after-shock” events that may follow. Finally, there is also strong evidence that leaders limit their information input when facing threats (Deverell 2010). Based on experimental research on corporate response to threats, Staw et al. (1981) show how decision-makers narrow their attention to a few more important issues. In this process, leaders tend to simplify and reduce the number of information channels they access, to lower their reliance on multiple inputs (Seeger et al. 2003).

On the other hand, too much emphasis on decisiveness can also be detrimental to how the crisis is handled (Deverell 2010). A number of empirical studies highlight the downsides of extensive focus on leadership decisiveness. Bechky and Okhuysen (2011) highlight the importance of seeking multiple views and examining work arrangements in organizations that are routinely faced with unpredictable and instable situations. Bigley and Roberts (2001) find that fire department leaders, who assess the situation and identify contingencies, instead of deterministically approaching the issue can enhance their team’s performance. Van Vugt et al. (2004) find that the procedural focus on leader decisiveness (i.e., autocratic style) can have a destabilizing influence on the organization.

These studies echo the dichotomy noted in the earlier section from theoretical explanations and literature reviews on leadership during crises. While leader decisiveness and leader adaptiveness are not fundamentally disadvantageous, too much emphasis on either may limit the effectiveness of the organization’s response effort.

The above observations suggest that a moderate level of ADM, one that considers the need for decisiveness, while recognizing the need for input from multiple sources may offer the best advantage for the company. Whereas extensive ADM can lead to better quality decisions, it is at the expense of more comprehensive selection process, which can be taxing on managerial attention and firm resources. Instead, limited ADM can lead to exacting and unyielding decisions that make them easier to follow and implement. Management literature has investigated the effectiveness of ADM (e.g., Bauer et al. 2013). We capture this relationship by suggesting for a curvilinear (u-shaped) relationship between leader ADM and damage from supply chain disruptions.

### ***3.2 Leader ADM and Unexpected Supply Chain Disruptions***

Unexpected disruptions are challenging because they leave no time for the company to gather information or to prepare for the ensuing damage (Yang and Xie 2000). Since there is limited warning, by the time sufficient information about the event becomes available, there may be no time left to adequately develop an effective response strategy (Stamatis 2003). For example, in the face of hurricane Katrina, many suppliers and manufacturers were caught by surprise, which paralyzed their response systems (Sheffi 2015).

Companies facing unexpected supply chain disruptions can benefit by using a decisive leader. Given their ambiguous nature, how unexpected disruptions are interpreted can be quite subjective. This can lead to multiple, and possibly, divergent interpretations on how response efforts should be managed (Tukiainen et al. 2010). Under these circumstances, a key priority for the leader is to maintain cohesion among the parties involved, even at the expense of placing constraints on how thoroughly decisions are examined. Leader's unwavering resolve and confidence are necessary to tame doubters and skeptics. Another common fallout of unexpected disruptions is confusion among the rank-and-file. If their confusion grows into "paralysis," it can cause other issues and may generate surprises of its own. Confusion between trade-partners (buyers and suppliers) can undermine cooperative efforts between their personnel and make their relationships fray (Florice and Miller 2001). Literature confirms the points offered above: that response to unexpected disruptions can be made more effective by having a leader that displays determination and resolve (Geraldi et al. 2010).

The above factors suggest that, with rising unexpectedness in supply chain disruptions, leader decisiveness becomes more effective. Therefore, we posit that with rising unexpectedness in supply chain disruptions, low-to-moderate levels of ADM become effective in minimizing damage from supply chain disruption.

### ***3.3 Leader ADM and Complicated Supply Chain Disruptions***

Supply chain disruptions become complicated when either more members of the supply chain are affected, or when multiple value streams (i.e., goods, information or finances) are severed. Complicated supply chain disruptions are challenging not only because there are multiple issues that have to be simultaneously addressed, but also because the issues are likely to be inter-related and interconnected (Cunha et al. 2006). Precipitating (initial) failures can lead to secondary failures causing further damage (Sundnes and Birnbaum 2003). The multiplicity and interaction of issues mean that company resources and management attention are often divided in trying to tackle several problems and their potential ramifications all at once.

As disruptions become more complicated, it becomes more difficult for the leader to appraise the likely outcomes of every step taken in response to the disruption. Careful assessment of complicated disruptions helps with assigning roles and responsibilities in the response effort. The careful assessment also helps consider intricacies to better prioritize tasks and to place resources where necessary. For instance, as members responsible for implementing solutions in one part of the chain take action, they affect the decisions and actions in other parts of the chain.

Careful assessment of complicated disruptions helps with leader effectiveness. Considering the full extent of the effects that the supply chain disruption is helpful because it allows the leader to incorporate multiple issues and interaction of the complicated supply chain disruption. Instead, a partial understanding of the situation can lead to decisions that may not resolve all aspects of the disruption. Svensson labels this as “holistic vulnerability approach,” or the ability to consider a system-wide view of the disruption (Svensson 2000). In contrast, an “atomistic vulnerability approach” is constrained to a minor and limited part of the supply chain (Manuj and Mentzer 2008). A holistic view allows for properly placing company resources in front of the more urgent, or more damaging facets of the disruption.

Literature in crisis leadership offers further support to the above. Leaders that appreciate the complicated nature of problems (i.e., pragmatic leaders) tend to perform better than others in the face of complicated situations (Hunter et al. 2009). Interestingly, results from a simulated experiment suggest that pragmatic leaders actually improve their performance when faced with more complicated settings (Bedell-Avers et al. 2008). In short, a thorough assessment of the situation by the leader can make company response efforts more effective in the face of complicated supply chain disruptions.

The above factors suggest that, with rising complicatedness in supply chain disruptions, leader adaptiveness becomes more effective. We posit that with rising complicatedness in supply chain disruptions, moderate-to-high levels of ADM become effective in minimizing damage from supply chain disruption.

### ***3.4 Leader ADM and Rare Supply Chain Disruptions***

Familiar disruptions reside in the organization's task domains and can be more easily recalled, making them easier to manage (Kovoor-Misra 2002). In contrast, rare disruptions offer no previous experience that parallels them. The right counter-measure is yet to be identified. As such, the firm cannot draw ideas from its memory on how to tackle rare disruptions (Lampel et al. 2009). There are no existing plans for delegation or prioritization of tasks in addressing rare disruptions. Organization's personnel have no clear-cut way to approach the disruption.

Previous research shows that reliable information about the extent of disruption can improve the overall performance of a company (Li et al. 2017). This is particularly important for facing rare disruptions. Given the extensive ambiguity of rare supply chain disruptions, inclusion and involvement of others can lead to better decisions. Careful assessment of rare disruptions seems necessary because the firm needs to compensate for its lack of understanding of the intricacies of the disruption. Careful assessment helps surface the nuances associated with a rare disruption so as to better prioritize tasks and to place resources where necessary.

The above suggests that a focus towards a more careful review of the ramifications of decisions may prove to be more effective in the face of rare disruptions. This suggests that leader adaptiveness can be effective with rising rarity of supply chain disruptions.

## **4 Methodology**

### ***4.1 Sample and Data Collection***

The data was gathered through a mixture of primary and secondary data sources. Primary data was collected to measure leadership competencies during supply chain disruptions from manufacturers using an online Qualtrics survey. Secondary data was obtained through COMPUSTAT and used to measure industry related variables and firm performance used as controls. Three follow-ups netted useful survey responses from a cross-section of 286 firms, resulting in a nearly 30% response rate. Missing data resulted in 35 responses being discarded.

### ***4.2 Variables and Measures***

The unit of analysis is firm response to supply chain disruptions. The supply chain, leadership, and operations literature were screened to identify relevant scales for the constructs used the study. For all constructs, multi-item 7-point Likert scale

(1-strongly disagree, 7-strongly agree) described in the following paragraphs were used.

Measurement of ADM was conducted using a three-item scale. The respondents were asked to evaluate their leader's adaptiveness by indicating how much they agree that their leader "suggests different angles," "seeks different views," and "suggests new ways." Characteristics of major supply chain disruptions were measured using three variables: unexpected, complicated, and enduring disruption.

Monitoring the performance of any production system should include both internal and external measure of performance (Stank, Crum, and Arango 1999). Thus, our operational damage scale consisted of seven items, including sales, access to technology, delivery reliability. In this context, we were interested in how the supply chain disruption negatively affected (directly and indirectly) the organization's response and recovery efforts. We asked respondents to evaluate the negative effect of the disruption, (7 point Likert 1-strongly disagree, 7-strongly agree). The reliability of the scale for the outcome variable (operational damage) was acceptable (Cronbach's alpha of 0.89), suggesting that operational damage can be considered as a unidimensional construct in the analyses.

**Control Variables.** We controlled for factors that could influence firm's operational damage in facing supply chain disruptions, as informed by prior literature on supply chain disruptions (Muffet-Willett and Kruse 2009; Sarros and Santora 2001). Statistical controls included firm size and financial performance, industry membership, the dynamism of firms' business context, the frequency of disruptions, and leadership characteristics. COMPUSTAT was used for financial data on public firms (fiscal years 2009, 2010, and 2011), while survey responses were used for private firms.

## 5 Analyses and Results

Multiple regression analysis was employed to test the proposed model. First, we explored the direct effects of ADM on operational damage. The results were found to be significant ( $\beta = 0.121$ ,  $p < 0.05$ ). They suggest that ADM is helpful in a leader's overall response to supply chain disruptions. However, in line with the argument for H1, ADM can be detrimental at extremely low or extremely high levels. At either extreme, ADM is associated with more operational damage from supply chain disruption. The summary of results is available in Table 2.

Second we addressed the effect of ADM on operational damage in the face of unexpected supply chain disruptions, suggesting that the effect of low-to-medium level ADM on limiting disruption damage becomes stronger with increased supply chain disruption unexpectedness. The results demonstrate significance ( $\beta = 0.061$ ,  $p < 0.05$ ). In the face of high unexpectedness of supply chain disruptions, limited ADM is more effective. Extensive ADM is more effective for supply chain disruptions with low unexpectedness. Here again, the subtleties of the resulting curvilinear relationship suggest that ADM is not as effective at extremely limited levels. Therefore,

**Table 2** Multiple regression analysis—outcome variable: operational damage

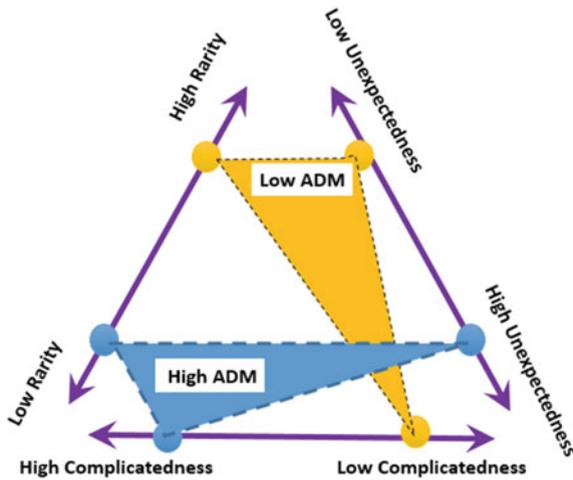
	Model 0 controls		Model 1 SC direct effects		Model 2 unexpected SC disruption		Model 3 SC disruption complicatedness		Model 4 SC disruption rarity	
	$\beta$	p-value	$\beta$	p-value	$\beta$	p-value	$\beta$	p-value	$\beta$	p-value
<b>Control variables<sup>a</sup></b>										
Size (sales)	-0.050	n/s	-0.050	n/s	-0.055	n/s	-0.047	n/s	-0.053	n/s
Environmental dynamism	0.335	0.001	0.335	0.001	0.313	0.001	0.302	0.002	0.337	0.006
Financial performance	-0.164	0.02	-0.164	0.02	-0.169	0.017	-0.169	0.019	-0.157	0.029
Frequency of disruptions	-0.020	n/s	-0.020	n/s	-0.012	n/s	-0.012	n/s	-0.082	n/s
Leader self-esteem	0.074	n/s	0.074	n/s	-0.081	n/s	-0.043	n/s	-0.019	n/s
Leader trusting personality	0.027	n/s	0.027	n/s	0.003	n/s	-0.069	n/s	0.061	n/s
Leader procrastination	-0.140	0.08	-0.140	n/s	-0.151	0.06	-0.148	0.059	-0.156	0.050
<b>Baseline leadership traits</b>										
Leader ADM			-1.317	0.001	1.298	n/s	0.344	n/s	-2.132	0.001
Leader ADM squared (HI)			<b>0.121</b>	<b>0.001</b>	-	n/s	-0.102	n/s	0.220	0.001
						0.185				
<b>Disruption type (direct effect)</b>										
Disruption unexpectedness					0.889	n/s				
Disruption complicatedness							0.578	n/s		
Disruption rarity									-0.652	n/s
<b>Disruption type (interaction effects)</b>										
Disruption unexpectedness <sup>a</sup> leader ADM					-0.519	0.039				

(continued)

Table 2 (continued)

	Model 0 controls		Model 1 SC direct effects		Model 2 unexpected SC disruption		Model 3 SC disruption complicatedness		Model 4 SC disruption rarity	
	$\beta$	p-value	$\beta$	p-value	$\beta$	p-value	$\beta$	p-value	$\beta$	p-value
Disruption unexpectedness <sup>a</sup> leader ADM squared (H2)					<b>0.061</b>	<b>0.018</b>				
Disruption complicatedness <sup>a</sup> leader ADM							-0.360	0.092		
Disruption complicatedness <sup>a</sup> leader ADM squared (H3)							<b>0.048</b>	<b>0.042</b>		
Disruption rarity <sup>a</sup> leader ADM									0.459	0.080
Disruption rarity <sup>a</sup> leader ADM squared (H4)									<b>-0.056</b>	<b>0.045</b>
Intercept	4.909		7.304		2.991		5.103		8.621	
R <sup>2</sup>	0.072		0.132		0.166		0.173		0.163	
F-value	1.351	0.119	2.343	0.004	2.527	0.001	2.601	0.001	2.324	0.002

<sup>a</sup> A total of eight industry categories were modeled. Results are excluded for parsimony



**Fig. 1** Triangular model of adaptive decision making in facing supply chain disruptions

decisive decision-making may be more optimal for supply chains caught off-guard by a highly unexpected disruption.

Third, we tested the relationship between ADM and operational damage when moderated by supply chain disruption complicatedness. The results were significant ( $\beta = 0.048$ ,  $p < 0.05$ ), but not supported. The results suggest that more complicated supply chain disruptions limit the effectiveness of ADM. The effectiveness of extensive ADM, meanwhile, is reduced. The curvilinear nature of the results indicates that ADM is particularly ineffective at extremely low levels. Figure 3 shows the relationship between ADM and operational damage moderated by complicatedness. Therefore, limited ADM in the face of complicated supply chain disruptions is advised, making decisive decision-making the preferable leadership approach under such circumstances (Table 3).

Finally, we examined the role of rarity on ADM and operational damage from supply chain disruptions. The results showed significance ( $\beta = -0.056$ ,  $p < 0.05$ ). As related to the unfamiliarity of supply chain disruptions, use of limited ADM leads to lower operational damage in the face of familiar duration disruptions (Fig. 4). This argues for decisive action being taken to limit operational damage when the disruption is familiar. However, in the face of rare disruptions, use of extensive ADM leads to lowering of operational damage, suggesting that prudent leadership may be the more preferable approach. The relationship between ADM and operational damage is graphically depicted on Fig. 1.

**Table 3** Summary of results

Hypothesis	Result	Implications
H1: Leader ADM carries a u-shaped relationship with operational damage from supply chain disruptions such that moderate level of ADM is associated with lower damage as compared to limited and extensive levels of ADM	Supported ( $\beta = 0.121, p < 0.05$ )	Findings suggest moderation is the best policy for leaders facing SC disruptions. Leaders that avoid extremes—be they in hasty decisiveness or cautious prudence—seem to help their organizations minimize the detrimental effects of SC disruptions
H2: Unexpected disruptions moderate the curvilinear association between leader ADM and SC disruption damage such that, with rising SC disruption unexpectedness, low—to-moderate levels of ADM lower the SC disruption damage	Supported ( $\beta = 0.061, p < 0.05$ )	The fact that unexpectedness, complicatedness, and rarity of SC disruption require variations on leadership emphasis is a manifest to the multifaceted and multidimensional characteristic of SC disruptions. Each SC disruption has the potential to be a uniquely unusual event such that the leader would need to customize the recognition, response and recovery efforts
H3: Complicated disruptions moderate the curvilinear association between leader ADM and damage from SC disruptions such that, with rising SC disruption complicatedness, moderate to high levels of ADM become more effective in minimizing the SC disruption damage	Supported ( $\beta = 0.048, p < 0.05$ )	
H4: Rare disruptions moderate the curvilinear association between leader ADM and damage from SC disruptions such that, with rising SC disruption rarity, moderate to high levels of ADM become more effective in minimizing the SC disruption damage	Supported ( $\beta = -0.056, p < 0.05$ )	

**5.1 Robustness Tests for Inverted U-Shaped Relationships**

In order to address the validity of inverted U-shaped relationship between ADM and operational damage, several measures were taken. First, following previous studies, all continuous variables were mean centered to minimize multicollinearity as well as provide robustness for a U-shaped curve (Aiken and West 1991).

Additionally, we employed an approach suggested by Wales et al. to further assess the validity of the inverted-U shaped relationship between ADM and operational damage (Wales et al. 2013; Lind and Mehlum 2010). Without these tests, it is challenging to determine whether the extreme point (or the inflection point) is within the bounds of the data. First, we begin with a Wald test to assess the joint significance of the direct and squared terms of logistics integration. The results confirmed that both terms are jointly statistically significant [ $F(2, 249) = 3.65$ ;  $\text{Prob} > F = 0.001$ ]. Then, the Sasabuchi test was used to estimate whether the effect of ADM on operational is increasing at low values of ADM and the effect of ADM on operational damage is decreasing at high values of ADM. It is essential to examine slopes at these bounds to confirm that the inverted U-shaped relationship is representative of the data and not a statistical artifact. Overall test of presence of a U-shaped relationship shows significance (t-value = 2.07;  $P < 0.05$ ). Furthermore, significant values of lower and upper bound slopes indicate the presence of a U-shaped relationship (Lower bound slope =  $-0.717$ ; t-value =  $-2.65$ ;  $P < 0.001$ ; Upper bound slope =  $0.375$ ; t-value = 2.07;  $P < 0.05$ ). Finally, to validate that the extreme point of the curve is within the upper and lower bounds of ADM, Fieller approach was applied. If the confidence intervals are within the bounds of the low and high values of ADM, it offers support for the presence of a U-shaped relationship in the data. The estimated extreme point is 4.94, which is positioned within the upper and lower bounds of ADM (95% Fieller interval for extreme point: [4.17; 6.63]).

## 6 Discussion

In this study, we assessed the impact of leadership traits that can induce a ripple effect during supply chain disruptions. We consider ADM as a continuum spanning both high and low levels of adaptiveness. Results of the study confirmed our primary hypotheses that a moderate level of ADM is optimal in relation to operational damage from the ripple effects in supply chain disruptions. When faced with rare disruptions, higher ADM is particularly effective. However, low ADM is more effective in the face of unexpected and complicated disruptions.

### 6.1 Empirical and Theoretical Contributions

Recent research supply chain management and crisis has recognized supply disruption management as an important area of research (Schoenherr et al. 2012). The true test of a supply chain leader is during challenging times. At no time is this better manifest than during supply chain disruptions, when the inter-organizational dynamics are further complicated by the time-pressures, ambiguities and high stakes associated with the disruption (Dooley and Lichtenstein 2008). Such situations amplify decision-making behavior and associated ramifications.

Our findings suggest that moderation is the best policy for leaders facing supply chain disruptions. Leaders that avoid extremes—be they in hasty decisiveness or cautious prudence—seem to help their organizations minimize the detrimental effects of supply chain disruptions. Moderation, leadership that simultaneously considers the need for quick and effective alongside thoughtful consideration for the potential ramification of their actions across the supply chain, seems most effective in the face of supply chain disruptions. These findings fall in line with that from a few studies in similar contexts (e.g., Van Wart and Kapucu 2011). Related to supply chains, Williams et al. (2002) find that neither autocratic nor participative leadership styles are more effective than the other. Instead, leaders whose key approach is adaptable are shown to be effective.

A second contribution of this paper is in highlighting the unique characteristics of supply chain disruptions. As we noted earlier, literature on crisis leadership has historically been dominated by research on community and humanitarian related disasters (e.g., Patton 2015; Quarantelli 1997). While insightful, results from these studies may not be fully compatible with the intricacies of supply chain disruptions, nor with the possible leadership styles necessary to address them. The fact that unexpectedness, complicatedness, and duration of supply chain disruption require variations on leadership emphasis is a manifest to the multifaceted and multidimensional characteristic of supply chain disruptions. Each supply chain disruption has the potential to be a uniquely unusual event such that the leader would need to customize the recognition, response, and recovery efforts to reduce the ripple effect. This further supports the idea that ADM be matched to the type of supply chain disruption being dealt with to help minimize damage from the ripple effect.

Leadership traits tend to be thought of in terms of positive capabilities, or ones that allow the individual to promote better decisions even in the face of uncertainty (Simpson et al. 2002). However, there are potential downsides to any particular trait that is being considered. Our findings suggest that it is the responsibility of the leader in charge at “ground zero” of the supply chain disruption to adapt and improvise when responding to a supply chain disruption. The goal is to reduce the ripple in the downstream supply chain. Relatedly, we contribute to the literature on leadership in the face of complicated settings. Leadership, by its nature, is a complicated activity (Hunt 2004). This study is one of few empirical examinations that allows for a test of some of the central ideas developed by the paradox perspective (Denison et al. 1995). Our findings support the general implication of the paradox perspective in that more effective leaders generally display a more complicated and varied set of behaviors.

Finally, critiques of leadership theories highlight the shortcomings of the literature by focusing primarily on charismatic and other vision-laden leaderships. Yukl (2005) notes the importance of highlighting the task and strategic-oriented behaviors of leaders. Hunt (2004), who has extensively chronicled leadership, explains: “When between one-third and one-half of recent scholarly leadership articles are devoted to transformational leadership... one wonders whatever happened to plain, unadorned leadership directed toward task completion” (p. 1524). Moreover, missing from many leadership studies is sufficient specification of situational variables

and facilitating conditions. Our study contributes to the leadership field of study by offering insights on the potential significance of considering adaptive leadership. This is particularly impactful for supply chain management, which can be extremely dynamic and turbulent.

## 6.2 *Practical Implications*

Our contribution to practice is in detailing how the intricate nature of supply chain disruptions creates thought-provoking challenges for leadership. As of late, many organizations have emphasized how they should prepare for and minimize the ripple effect of risks due to supply chain disruptions. However, the manner in which actual supply chain disruptions are to be handled is not as prominent of a topic within the supply chain management literature. Moving beyond the preparatory and risk mitigating stages of disruption management, this study offers explanation on how outstanding supply chain management leadership in the face of supply chain disruptions may decide and direct the organization through and past the danger introduced.

The findings above are particularly important to supply chain management leaders, as it is likely that many managers would have inclinations towards one particular style over another. It is increasingly clear that supply chains established during more stable times need to be reshaped for operation in an era of increased volatility. Supply chain leaders should be able to synthesize external and internal data and rapidly take action to minimize the impact of a disruption (Culp 2013). Each leader, perhaps even innately, has a preference towards being decisive or prudent. As Devitt and Borodzicz (2008) note, “Leaders managing crises under stressful situations are likely to revert to the style which they are most comfortable.” In fact, the urge to leverage the most comfortable approaches become stronger as the challenge posed by the crises increases in intensity (Deveitt and Borodzicz 2008). As evidenced here, this can be detrimental in the face of supply chain disruptions, which requires blending different leadership styles. For example, in 2012 the auto industry was rocked by a shortage of a specialty resin because the key supplier experienced a devastating explosion in its plant. It took the supplier six months to restart production, during which time the downstream production facilities of Ford and other major automakers were severely disrupted. If Ford supply managers were adaptive and decisive, they would have detected the risk exposure and associated production bottleneck and proactively worked with the supplier to fast-track its plans to bring online a new plant (Simchi-Levi et al. 2014). The challenge for most leaders is to behave confidently in uncertain times, yet do so with as much information and intelligence as they can generate.

One of the contributions of particular note from this study for managers is the notion of leadership under complicated supply chain disruptions. Contrary to findings from studies outside of the supply chain context (e.g., Strange and Mumford 2002) we find that leaders demonstrating prudent decision making do indeed perform better with regards to minimizing operational damage. The ability of a leader to adapt to a changing and complicated environment is a key foundation of crisis leadership

in supply chain management. For example, supply managers' adaptability (achieved in this case by adjusting workforce skills and processes) allowed Toyota to quickly restore the supply of brake-fluid-proportioning valves (P-valves) after a major disruption (Simchi-Levi et al. 2014). Far too often are examples of crisis leaders that foreclose on options, cutting off or ignoring points of information when making vital decisions. This is undesirable, especially as crisis decision making requires an ability to think quickly and rationally, as well as to act. The consequence of muddled thinking or ignoring key situational factors can result in further disaster.

### **6.3 Future Research and Limitations**

This study explored leadership approaches related to ADM in response to varying types of disruptions. The results of this study need to be considered alongside their limitations. We recognize the limitations of empirically based studies. For example, the responses garnered from this research were from managers working for Italian-based organizations. While these managers were spread across 25 multi-national companies with international supply chains that may be from numerous countries, future research should look at a broader array of countries.

While past research in SCM has focused extensively on overarching strategic aspects of the discipline (Giunipero and Eltantawy 2004), more recent research has called for attention to be paid to the "people" dimensions that contribute to supply chain functions (Wieland et al. 2016). To date, little research has examined the differences between leadership in supply chains, versus in other management contexts. We would echo the words of Thornton et al. (2016), who points out that "Without a savvy leader, the needs of supply chain management may be overlooked because they have no advocate to push their orientation within the firm." As supply chain managers continue to assume executive roles in the upper echelons of the corporate hierarchy, pointing to the increasing strategic importance of supply chain management (Wagner and Kemmerling 2015), we would argue for the need for future studies examining aspects of leadership within supply chain management.

Another direction for future research is considering whether moderation policy for leaders facing SC disruptions can affect SC efficiency. Previous research highlighted that various SCM decisions are rooted in the efficiency thoughts and resilience is frequently considered as a trade-off with the efficiency (Ivanov and Dolgui 2018). While leaders that avoid extremes may improve SC resilience, they might also decrease SC efficiency since the decision-making speed decreases. Ivanov and Dolgui (2018) offer several opportunities for future exploration, time-to-recover being among those areas needing more attention. For example, the relationship between lead time extensions and efficiency within the SC resilience context is fertile ground for future analysis. Simulation experiments, but also, observational techniques could be useful methods for examining such relationships.

Since there is no universal, ideal prescription of management response to supply chain disasters, another important consideration is that each disruption can have a

notably different set of characteristics and therefore a uniquely designed combination of countermeasures to address them. For example, cultural aspects may be a factor, as certain cultures and communities celebrate decisive assertiveness and dominant styles of leadership. Others yearn for more modest servant leaders if they are willing to tolerate leaders at all. Societal and organizational expectations of leaders vary enormously from setting to setting, according to the requirements of context. In virtually every society and setting, we require leaders to be alternately collaborative and competitive.

The findings from this study represent the first known effort examining ADM to various SC disruptions. Given the noted variability of disruptions, opportunities for future research might include an examination of more specific disruption types common to supply chain management. These could include stock-outs, product recalls, and others, which can have disastrous effects that ripple throughout the supply chain. Also, while this study measured leadership via a survey in combination with archival financial measures, future work may utilize other methods. For example, the deductive case-based analysis might be particularly useful for delving more deeply into contextual factors impacting leadership and ADM. Future researchers might also want to look at leadership and ADM across the various stages of response to a disruption, i.e., prevention, mitigation, response, and recovery (Shaheen et al. 2018). Additionally, the regulatory concerns of certain countries might partially impact the speed of a response. Leadership under conditions where the public-private partnership has an extensive role may be of importance to managers coping with SC disruptions.

## 7 Conclusion

It only takes an instant for a smoothly running supply chain to be stricken by disaster. In these critical moments, the right leadership approach can impact the level of turmoil the organization, and connected supply chain stakeholders must suffer through. Such inter-organizational exchanges drive the right level of ADM, in terms of decisive speed versus methodical prudence. Using paradox and leadership theories, this research revealed how different forms of ADM impacts the extent of operational damage under various types of SC disruptions. While prior research tends to describe quick responding, visionary leaders as ideal in crises situations, our research demonstrates that in the face of different SC disruptions, leadership is indeed paradoxical. Clearly, our research demonstrates the importance of leadership for the supply chain research and practitioner communities.

## References

- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park: Sage Publications.
- Ambulkar, S., Blackhurst, J. V., & Cantor, D. E. (2016). Supply chain risk mitigation competency: an individual-level knowledge-based perspective. *International Journal of Production Research*, 54(5), 1398–1411.
- Ansoff, H. I. (1975). Managing strategic surprise by response to weak signals. *California Management Review*, 18(2), 21–33.
- Azadegan, A., & Jayaram, J. (2018) Resiliency in supply chain systems: A triadic framework using family resilience model. In *Supply Chain Risk Management* (pp. 269–288). Singapore: Springer.
- Bauer, J. C., Schmitt, P., Morwitz, V. G., & Winer, R. S. (2013). Managerial decision making in customer management: adaptive, fast and frugal? *Journal of the Academy of Marketing Science*, 41(4), 436–455.
- Bechky, B. A., & Okhuysen, G. A. (2011). Expecting the unexpected? How SWAT officers and film crews handle surprises. *Academy of Management Journal*, 54(2), 239–261.
- Bedell-Avers, K. E., Hunter, S. T., & Mumford, M. D. (2008). Conditions of problem-solving and the performance of charismatic, ideological, and pragmatic leaders: A comparative experimental study. *The Leadership Quarterly*, 19(1), 89–106.
- Bigley, G. A., & Roberts, K. H. (2001). The incident command system: High-reliability organizing for complex and volatile task environments. *Academy of Management Journal*, 44(6), 1281–1299.
- Bode, C., & Wagner, S. M. (2015). Structural drivers of upstream supply chain complexity and the frequency of supply chain disruptions. *Journal of Operations Management*, 36(1), 215–228.
- Boin, A., & Lagadec, P. (2000). Preparing for the future: Critical challenges in crisis management. *Journal of Contingencies and Crisis Management*, 8(4), 185–191.
- Brandon-Jones, E., Squire, B., Autry, C. W., & Petersen, K. J. (2014). A contingent resource-based perspective of supply chain resilience and robustness. *Journal of Supply Chain Management*, 50(3), 55–73.
- Cavanaugh, J. C., Gelles, M. G., Reyes, G., Civiello, C. L., & Zahner, M. (2008). Effectively planning for and managing major disasters. *The Psychologist-Manager Journal*, 11(2), 221–239.
- Collins, J. (2005). Level 5 leadership: The triumph of humility and fierce resolve. *Harvard Business Review*, 7–8, 136.
- Cousins, P. D., Giunipero, L., Handfield, R. B., & Eltantawy, R. (2006). Supply management's evolution: Key skill sets for the supply manager of the future. *International Journal of Operations and Production Management*, 26(7), 822–844.
- Craighead, C. W., Blackhurst, J., Rungtusanatham, M. J., & Handfield, R. B. (2007). The severity of supply chain disruptions: Design characteristics and mitigation capabilities. *Decision Sciences*, 38(1), 131–156.
- Culp, S. (2013) *Supply chain disruption a major threat to business*. Forbes. Retrieved from.
- Cunha, M. P., Clegg, S. R., & Kamoche, K. (2006). Surprises in management and organization: Concept, sources and a typology. *British Journal of Management*, 17(4), 317–329.
- Defee, C. C., Stank, T. P., Esper, T. L., & Mentzer, J. T. (2009). The role of followers in supply chains. *Journal of Business Logistics*, 30(2), 65–84.
- Denison, D. R., Hooijberg, R., & Quinn, R. E. (1995). Paradox and performance: Toward a theory of behavioral complexity in managerial leadership. *Organization Science*, 6(5), 524–540.
- Deverell, E. (2010). Flexibility and rigidity in crisis management and learning at Swedish public organizations. *Public Management Review*, 12(5), 679–700.
- Devitt, K. R., & Borodzicz, E. P. (2008). Interwoven leadership: The missing link in multi-agency major incident response. *Journal of Contingencies and Crisis Management*, 16(4), 208–216.
- Dittman, P. (2014). Game-changing trends in supply chain: Managing risk in the global supply chain. The Global Supply Chain Institute Report 3.
- Dolgui, A., Ivanov, D., & Sokolov, B. (2018). Ripple effect in the supply chain: An analysis and recent literature. *International Journal of Production Research*, 56(1–2), 414–430.

- Dooley, K. J., & Lichtenstein, B. (2008) *Research methods for studying the complexity dynamics of leadership. Complexity leadership. part I: Conceptual foundation* (pp 269–290).
- DuBrin, A. J. (2014). Personal attributes and behaviors of effective crisis leaders. In *Handbook of research on crisis leadership in organizations*. Northampton: Edward Elgar Publishing.
- Dutton, J. E. (1986). The processing of crisis and non-crisis strategic issues. *Journal of Management Studies*, 23(5), 501–517.
- Dynes, R., Quarantelli, E. L., & Kreps, G. (1981). *A perspective on disaster planning*. Disaster Research Center, University of Delaware, Newark, Delaware.
- Eisenstat, R. A., Beer, M., Foote, N., Fredberg, T., & Norrgren, F. (2008). The uncompromising leader. *Harvard Business Review*, 86(7–8), 50.
- Ellinger, A., & Ellinger, A. D. (2013). Leveraging human resource development expertise to improve supply chain managers' skills and competencies. *European Journal of Training and Development*, 38(1/2), 118–135.
- Essex, A., Subramanian, N., & Gunasekaran, A. (2016). The relationship between supply chain manager capabilities and performance: empirical evidence. *Production Planning and Control*, 27(3), 198–211.
- Fawcett, S. E., Fawcett, S. E., Andraski, J. C., Fawcett, A. M., & Magnan, G. M. (2010). The indispensable supply chain leader. *Supply Chain Management Review*, 14(5), 22–29.
- Florice, S., & Miller, R. (2001). Strategizing for anticipated risks and turbulence in large-scale engineering projects. *International Journal of Project Management*, 19(8), 445–455.
- Gammelgaard, B., & Larson, P. D. (2001). Logistics skills and competencies for supply chain management. *Journal of Business Logistics*, 22(2), 27–50.
- Geraldi, J. G., Lee-Kelley, L., & Kutsch, E. (2010). The Titanic sunk, so what? Project manager response to unexpected events. *International Journal of Project Management*, 28(6), 547–558.
- Ginter, P. M., Duncan, W. J., McCormick, L. C., Rucks, A. C., Wingate, M. S., & Abdolrasulnia, M. (2006). Effective response to large-scale disasters: The need for high-reliability preparedness networks. *International Journal of Mass Emergencies and Disasters*, 24(3), 331.
- Giunipero, L. C., & Aly Eltantawy, R. (2004). Securing the upstream supply chain: A risk management approach. *International Journal of Physical Distribution and Logistics Management*, 34(9), 698–713.
- Haddon, A., Loughlin, C., & McNally, C. (2015). Leadership in a time of financial crisis: What do we want from our leaders? *Leadership and Organization Development Journal*, 36(5), 612–627.
- Hannah, S. T., Balthazard, P. A., Waldman, D. A., Jennings, P. L., & Thatcher, R. W. (2013). The psychological and neurological bases of leader self-complexity and effects on adaptive decision-making. *Journal of Applied Psychology*, 98(3), 393.
- Harvey, M. G., & Richey, R. G. (2001). Global supply chain management: The selection of globally competent managers. *Journal of International Management*, 7(2), 105–128.
- Heifetz, R., Grashow, A., & Linsky, M. (2009). Leadership in a (permanent) crisis. *Harvard Business Review*, 87(7/8), 62–69.
- Hendricks, K. B., & Singhal, V. R. (2003). The effect of supply chain glitches on shareholder wealth. *Journal of Operations Management*, 21(5), 501–522.
- House, R. J. (1971). A path goal theory of leader effectiveness. *Administrative Science Quarterly* 321–339.
- Howell, J. M., & Shea, C. M. (2006). Effects of champion behavior, team potency, and external communication activities on predicting team performance. *Group and Organization Management*, 31(2), 180–211.
- Hult, G. T. M., Ketchen, D. J., & Chabowski, B. R. (2007). Leadership, the buying center, and supply chain performance: A study of linked users, buyers, and suppliers. *Industrial Marketing Management*, 36(3), 393–403.
- Hunt, J. G. (2004). Task leadership. In G. R. Goethels, G. J. Sorensen, & J. M. Burns (Eds.), *Encyclopedia of leadership*. Thousand Oaks: Sage.

- Hunt, J. G., Boal, K. B., & Dodge, G. E. (1999). The effects of visionary and crisis-responsive charisma on followers: An experimental examination of two kinds of charismatic leadership. *The Leadership Quarterly*, 10(3), 423–448.
- Hunter, S. T., Bedell-Avers, K. E., & Mumford, M. D. (2009). Impact of situational framing and complexity on charismatic, ideological and pragmatic leaders: Investigation using a computer simulation. *The Leadership Quarterly*, 20(3), 383–404.
- Ivanov, D., & Dolgui, A. (2018). Low-Certainty-Need (LCN) supply chains: a new perspective in managing disruption risks and resilience. *International Journal of Production Research* 1–18.
- Ivanov, D., Sokolov, B., & Dolgui, A. (2014). The ripple effect in supply chains: Trade-off 'efficiency-flexibility-resilience' in disruption management. *International Journal of Production Research*, 52(7), 2154–2172.
- James, E. H., & Wooten, L. P. (2005). Leadership as (Un) usual: How to display competence in times of crisis. *Organizational Dynamics*, 34(2), 141–152.
- Ketchen, D. J., Wowak, K. D., & Craighead, C. W. (2014). Resource gaps and resource orchestration shortfalls in supply chain management: The case of product recalls. *Journal of Supply Chain Management*, 50(3), 6–15.
- Kovoor-Misra, S. (2002). Boxed-in:: Top managers' propensities during crisis issue diagnosis. *Technological Forecasting and Social Change*, 69(8), 803–817.
- Lampel, J., Shamsie, J., & Shapira, Z. (2009). Experiencing the improbable: Rare events and organizational learning. *Organization Science*, 20(5), 835–845.
- Lewis, M. W. (2000). Exploring paradox: Toward a more comprehensive guide. *Academy of Management Review*, 25(4), 760–776.
- Li, X., Wu, Q., Holsapple, C. W., & Goldsby, T. (2017). An empirical examination of firm financial performance along dimensions of supply chain resilience. *Management Research Review*, 40(3), 254–269.
- Lind, J. T., & Mehlum, H. (2010). With or without U? The appropriate test for a U-shaped relationship. *Oxford Bulletin of Economics and Statistics*, 72(1), 109–118.
- Lukina, I., Azadegan, A., Hooker, R., & Lucianetti, L. (2017). Leadership in the face of major supply chain disruptions: baseline and contextual traits. In *Academy of Management Proceedings 2017* (vol. 1, p. 15644). Briarcliff Manor, NY 10510: Academy of Management.
- Lüscher, L. S., & Lewis, M. W. (2008). Organizational change and managerial sensemaking: Working through paradox. *Academy of Management Journal*, 51(2), 221–240.
- Macdonald, J. R., & Corsi, T. M. (2013). Supply chain disruption management: Severe events, recovery, and performance. *Journal of Business Logistics*, 34(4), 270–288.
- Mangan, J., & Christopher, M. (2005). Management development and the supply chain manager of the future. *The International Journal of Logistics Management*, 16(2), 178–191.
- Manuj, I., & Mentzer, J. T. (2008). Global supply chain risk management. *Journal of Business Logistics*, 29(1), 133–155.
- Muffet-Willett, S., & Kruse, S. (2009). Crisis leadership: Past research and future directions. *Journal of Business Continuity and Emergency Planning*, 3(3), 248–258.
- Mulder, M., Ritsema van Eck, J. R., & De Jong, R. D. (1971). An organization in crisis and non-crisis situations. *Human Relations*, 24(1), 19–41.
- Novak, D. (2009). *The Education of an Accidental CEO: Lessons Learned from the Trailer Park to the Corner Office*. Crown Business.
- Overstreet, R. E., Hanna, J. B., Byrd, T. A., Cegielski, C. G., & Hazen, B. T. (2013). Leadership style and organizational innovativeness drive motor carriers toward sustained performance. *The International Journal of Logistics Management*, 24(2), 247–270.
- Özçelik, G., & Cenkci, T. (2014). Moderating effects of job embeddedness on the relationship between paternalistic leadership and in-role job performance. *Procedia-Social and Behavioral Sciences*, 150, 872–880.
- Park, Y., Hong, P., & Roh, J. J. (2013). Supply chain lessons from the catastrophic natural disaster in Japan. *Business Horizons*, 56(1), 75–85.

- Parker, G. G., & Anderson, E. G. (2002). From buyer to integrator: The transformation of the supply-chain manager in the vertically disintegrating firm. *Production and Operations Management*, 11(1), 75–91.
- Patton, M. Q. (2015). *Qualitative research and evaluation methods: Integrating theory and practice*. Thousand Oaks, CA: SAGE Publications.
- Payne, J. W., Bettman, J. R., & Johnson, E. J. (1993). *The adaptive decision maker*. Cambridge University Press.
- Pearson, C. M., & Clair, J. A. (1998). Reframing crisis management. *Academy of Management Review*, 23(1), 59–76.
- Peterson, T. O., & Van Fleet, D. D. (2008). A tale of two situations: An empirical study of behavior by not-for-profit managerial leaders. *Public Performance and Management Review*, 31(4), 503–516.
- Pillai, R., & Meindl, J. R. (1998). Context and charisma: A “meso” level examination of the relationship of organic structure, collectivism, and crisis to charismatic leadership. *Journal of Management*, 24(5), 643–671.
- Poole, M. S., & Van de Ven, A. H. (1989). Using paradox to build management and organization theories. *Academy of Management Review*, 14(4), 562–578.
- Prokesh, S. (1986). Man in the News; A Leader in Crisis: James E Burke. *The New York Times*, 2(19), B6.
- Quarantelli, E. L. (1997). Ten criteria for evaluating the management of community disasters. *Disasters*, 21(1), 39–56.
- Richey, R. G., Tokman, M., & Wheeler, A. R. (2006). A supply chain manager selection methodology: Empirical test and suggested application. *Journal of Business Logistics*, 27(2), 163–190.
- Roberts, N. C., & Bradley, R. T. (1988). Limits of charisma. In J. A. Conger & R. N. Kanungo (Eds.), *Charismatic leadership: The elusive factor in organizational effectiveness*. San Francisco: Jossey-Bass.
- Sarros, J. C., & Santora, J. C. (2001). The transformational-transactional leadership model in practice. *Leadership and Organization Development Journal*, 22(8), 383–394.
- Schoenherr, T., Modi, S. B., Benton, W. C., Carter, C. R., Choi, T. Y., Larson, P. D., et al. (2012). Research opportunities in purchasing and supply management. *International Journal of Production Research*, 50(16), 4556–4579.
- Seeger, M. W., Sellnow T. L., & Ulmer, R. R. (2003). *Communication and organizational crisis*. Greenwood Publishing Group.
- Shaheen, I., Azadegan, A., Lucianetti, L., & Qi, L. (2017). Leading organizations through supply chain disruptions: An exploratory study of necessary traits. *Rutgers Business Review*.
- Shaheen, I., Azadegan, A., & Davis, D. (2018). After the triggering event: A phasic perspective on leadership during supply chain disruptions. In *Academy of management proceedings forthcoming*.
- Shaw, R., & Goda, K. (2004). From disaster to sustainable civil society: The Kobe experience. *Disasters*, 28(1), 16–40.
- Sheffi, Y. (2015). *The power of resilience: How the best companies manage the unexpected*. New York: MIT Press.
- Sheffi, Y., & Rice, J. B., Jr. (2005). A supply chain view of the resilient enterprise. *MIT Sloan management review*, 47(1), 41.
- Shenkman, R. (2000). *Presidential ambition: Gaining power at any cost*. Harper Collins.
- Shou, Y., & Wang, W. (2017). Multidimensional competences of supply chain managers: An empirical study. *Enterprise Information Systems*, 11(1), 58–74.
- Simchi-Levi, D., Schmidt, W., & Wei, Y. (2014). From superstorms to factory fires: Managing unpredictable supply-chain disruptions. *Harvard Business Review*.
- Simpson, P. F., French, R., & Harvey, C. E. (2002). Leadership and negative capability. *Human Relations*, 55(10), 1209–1226.
- Soergel, A. (2016). *Economy still reeling from west coast slowdown*. US News and World Report.
- Sokolov, B., Ivanov, D., Dolgui, A., & Pavlov, A. (2016). Structural quantification of the ripple effect in the supply chain. *International Journal of Production Research*, 54(1), 152–169.

- Spekman, R. E., Kamauff, J. W., Jr., & Myhr, N. (1998). An empirical investigation into supply chain management: A perspective on partnerships. *Supply Chain Management: An International Journal*, 3(2), 53–67.
- Stamatis, D. H. (2003). *Failure mode and effect analysis: FMEA from theory to execution*. Milwaukee, WI: American Society for Quality Press.
- Stank, T., Crum, M., & Arango, M. (1999). Benefits of interfirm coordination in food industry supply chains. *Journal of Business Logistics*, 20(2), 21.
- Staw, B. M., Sandelands, L. E., & Dutton J. E. (1981) Threat rigidity effects in organizational behavior: A multilevel analysis. *Administrative Science Quarterly* 501–524.
- Stern, E. (2013). Preparing: The sixth task of crisis leadership. *Journal of Leadership Studies*, 7(3), 51–56.
- Strange, J. M., & Mumford, M. D. (2002). The origins of vision: Charismatic versus ideological leadership. *The Leadership Quarterly*, 13(4), 343–377.
- Sundnes, K. O., & Birnbaum, M. L. (2003). Health disaster management: Guidelines for evaluation and research in the Utstein style. *Prehospital and Disaster Medicine* 17 (Supplement 3).
- Svensson, G. (2000). A conceptual framework for the analysis of vulnerability in supply chains. *International Journal of Physical Distribution and Logistics Management*, 30(9), 731–750.
- Tatham, P., & Kovács, G. (2010). The application of “swift trust” to humanitarian logistics. *International Journal of Production Economics*, 126(1), 35–45.
- Thornton, L. M., Esper, T. L., & Autry, C. W. (2016). Leader or lobbyist? How organizational politics and top supply chain manager political skill impacts supply chain orientation and internal integration. *Journal of Supply Chain Management*, 52(4), 42–62.
- Tukiainen, S., Aaltonen, K., & Murtonen, M. (2010). Coping with an unexpected event: Project managers’ contrasting sensemaking in a stakeholder conflict in China. *International Journal of Managing Projects in Business*, 3(3), 526–543.
- Van Hoek, R. I., Chatham, R., & Wilding, R. (2002). Managers in supply chain management, the critical dimension. *Supply Chain Management: An International Journal*, 7(3), 119–125.
- Van Vugt, M., Jepson, S. F., Hart, C. M., & Cremer, D. De. (2004). Autocratic leadership in social dilemmas: A threat to group stability. *Journal of Experimental Social Psychology*, 40(1), 1–13.
- Van Wart, M., & Kapucu, N. (2011). Crisis management competencies: The case of emergency managers in the USA. *Public Management Review*, 13(4), 489–511.
- Van Wassenhove, L. N. (2006). Humanitarian aid logistics: Supply chain management in high gear. *Journal of the Operational Research Society*, 57(5), 475–489.
- Wagner, S. M., & Bode, C. (2006). An empirical investigation into supply chain vulnerability. *Journal of Purchasing and Supply Management*, 12(6), 301–312.
- Wagner, S. M., & Kemmerling, R. (2015). Supply chain management executives in corporate upper echelons. *Journal of Purchasing and Supply Management*, 20(3), 156–166.
- Wales, W. J., Patel, P. C., Parida, V., & Kreiser, P. M. (2013). Nonlinear effects of entrepreneurial orientation on small firm performance: The moderating role of resource orchestration capabilities. *Strategic Entrepreneurship Journal*, 7(2), 93–121.
- Wieland, A., Handfield, R. B., & Durach, C. F. (2016). Mapping the landscape of future research themes in supply chain management. *Journal of Business Logistics*, 37(3), 205–212.
- Williams, L. R., Esper, T. L., & Ozment, J. (2002). The electronic supply chain: Its impact on the current and future structure of strategic alliances, partnerships and logistics leadership. *International Journal of Physical Distribution and Logistics Management*, 32(8), 703–719.
- Wilson, K., & Barbat, V. (2015). The supply chain manager as political-entrepreneur? *Industrial Marketing Management*, 49(8), 67–79.
- Yang, B., & Xie, M. (2000). A study of operational and testing reliability in software reliability analysis. *Reliability Engineering and System Safety*, 70(3), 323–329.
- Youn, S., Yang, M. G. M., & Hong, P. (2012). Integrative leadership for effective supply chain implementation: An empirical study of Korean firms. *International Journal of Production Economics*, 139(1), 237–246.

- Yukl, G. (2005). *Leadership in organizations*. United Kingdom: Pearson/Prentice Hall.
- Yukl, G., & Mahsud, R. (2010). Why flexible and adaptive leadership is essential. *Consulting Psychology Journal: Practice and Research*, 62(2), 81.