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Learning from Near-miss Events: An Organizational Learning Perspective on Supply Chain Disruption Response

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Abstract – Studying near-miss events – occasions when a company comes close to being negatively impacted – can help identify systemic issues and thereby enhance organizational resilience. However, what is not known is how firms learn from near-miss events, and how their learning is translated into response strategies in the face of supply chain disruptions. In this study, we address the following research questions - How does exposure to near-misses reflect in organizational response strategies to supply chain disruptions? Using single and double-loop learning from organizational learning theory, we examine how firms implement response strategies based on near-miss events. In addition, we examine the moderating effects of institutional pressures (from regulatory bodies and industry associations) into the model. We test the hypotheses using responses from 448 organizations in Germany, Switzerland and Sweden. Our results indicate that exposure to near-miss events leads firms to strengthen their focus on procedural response strategies and to lower their focus on flexible response strategies. Industry pressure furthers the effects of near-miss exposure in applying procedural strategies and limiting the application of flexible strategies. Regulatory pressure furthers the effects of near-miss exposure in limiting the application of flexible strategies. This study extends the body of supply chain disruption management to the concept of near-misses and explains how institutional context play a major role in learning of supply chain disruption responses.

Highlights

- Near-miss events strengthen the firm’s procedural response strategies and lower focus on flexible response strategies.
- Industry pressure moderates the relationship between near-miss events and procedural response strategies (strengthens) and flexible response strategies (weakens).
- Regulatory pressure weakens the relationship between near-miss exposure and flexible response strategies.

Keywords: Near-miss; Flexible response strategy; Procedural response strategy; Single-loop learning; Double-loop learning; Regulatory pressure; Industry pressure

Introduction

Today's ever more complicated and global business environment has led many companies to become concerned about risks and disruptions in their supply chains (Azadegan and Jayaram, 2018; Shaheen et al., 2017). As supply chain disruptions become seemingly more damaging and prevalent, company preparedness and response have also raised in importance (Culp, 2013; Scott, 2016).

Management scholars postulated different theoretical lenses to examine risk in organizations and ways to mitigate them. For instance, normal accident theory (NAT) suggests that accidents are inevitable and occur due to tight coupling between components and also due to the complexity of systems (Perrow, 1994). The Swiss cheese model suggests that firms can minimize risks by incorporating both hard (systems based) and soft (people based) countermeasures (Reason, 1990). Yet, there will be instances where the countermeasures may fail due to the perfect alignment of events and conditions. High-reliability organization (HRO) researchers posit that we can learn a lot from organizations that are prone to catastrophic failures but do not manifest as frequently, such as aircraft carriers, air traffic control or nuclear power plants (Roberts, 1990; Speier et al., 2011). These theories were postulated to help manage major failures. Yet, major failures do not occur frequently enough to gain substantial understanding from them. Further, while these theories are effective in analyzing the reasons behind failures, they may not be able to provide insights on how to prevent these failures (Reason, 1990). HRO researchers and proponents of the Swiss cheese model recommended the use of *near-misses* in large-scale systems as an alternative reporting mechanism to understand vulnerabilities in the operational processes and routines (Grabowski and Roberts, 1997).

Near-misses are occasions when a company comes close to being negatively impacted but is not (Habermann et al., 2015). Whereas deviations from operational norms may propagate across the supply chain and cause breakdowns, identifying and studying near-misses can help deter such damaging occurrences (Pettit et al., 2010). Near-miss events raise awareness and preparedness in facing supply chain disruptions (Sheaffer et al., 1998). Across an assortment of scientific fields, there are strong theoretically based arguments and empirical evidence on how attention to near-misses can be a viable approach to error identification (Baumard and Starbuck, 2005; Kleindorfer et al., 2012). As we will detail in upcoming sections, literature in medical research, psychology, safety science, healthcare, and transportation have all offered substantial evidence on the potential benefits of tracking near-misses. In organization science, Perrow (2011) suggests that "*almost disruptions*" are a good indicator of risks in systems. Others suggest that near-misses provide opportunities to better understand the resilience of an organization to better detect and prioritize risks (Dillon and Tinsley, 2008; Sheffi, 2015).

Studying the effect of near-misses on organizational behavior in supply chain contexts is particularly important given the growing dependency of companies on upstream suppliers (Sheffi, 2015). Today's fast-moving business environment requires organizations to be diligent so as to quickly respond to harmful events in their operating environment (Dabhilkar et al., 2016). Detecting and analyzing near-misses is one way to prepare for, and even prevent, supply chain disruptions (Sheffi, 2015). Risk management experts suggest that near-misses could be opportunities that remind top management on taking the necessary steps to avert their supply chain from major disruptions (Rothman, 2014). The following examples illustrate such a case in the supply chain context.

In early February 2016, a strong earthquake shook production facilities belonging to TSMC in southern Taiwan. TSMC is the sole supplier of the A10 processor for Apple's iPhone 7. TSMC and Apple were lucky. Sensitive production machinery and the inventories of silicon wafers used in producing the processors were left unharmed (Webb, 2016). TSMC and its downstream customers did not take the issue lightly. Shortly after the event, they developed procedures for alternate sources of supply and for improving their responsiveness to similar supply chain disruptions. For Cisco Systems, the impetus to improve its supply chain risk management infrastructure was the company's close call with Hurricane Rita in 2005 (Conway et al., 2015). Because of the near-miss, company executives recognized that "they were not fully prepared to respond systematically to a major event" (Sowinski, 2011; pp 3).

Not all companies take near-misses as seriously as TSMC or Cisco Systems do. Despite the copious theoretical support and empirical evidence for the usefulness of near-misses, many companies are apathetic to their utility. Some consider near-misses as "transitory events" that result in "superstitious learning" (Lampel et al., 2009). Others view near-misses as too minor and inconsequential (Wright and van der Schaaf, 2004). Such apprehensions may be caused by a lack of recognition of the lessons that near-misses can offer. Indeed, how learning from near-misses leads to organizational behaviors in facing disruptions has yet to be studied in supply chain management research. Hence, our primary research question is: How does exposure to near-misses reflect in organizational response strategies to supply chain disruptions?

When faced with disruptions, companies orient their response efforts in two strategic directions: some use a procedural strategy while others use a flexible strategy (Deverell and Olsson, 2010; Harrald, 2006). We define procedural response strategy as formal protocols followed by organizations when managing disruptions. This may include formal policies and procedures, assigned roles and responsibilities and resources allocated appropriately. From an organizational standpoint, procedural strategy entails identifying system-level procedures that are established, and the operators are expected to adhere to these processes (Leveson et al., 2009). Flexible response strategy is the ability of the firm to make decisions that may deviate from established plans and protocols to suit the needs of the situation. Flexible response strategy expects that operators may deviate from predetermined plans and adapt to the situation on the ground (Leveson et al., 2009). Literature has shown that both responses might be effective. However, as of yet, how exposure to and learning from near-miss events leads to organizational behaviors in facing disruptions has not been studied (Drupsteen and Wybo, 2015).

We apply organizational learning theory as related to single and double-loop learning (Argyris, 1976) to explain how near-misses result in either flexible or procedural response strategies. Single-loop learning focuses on correcting errors using existing behaviors and norms (Jeffs et al., 2012). In contrast, double-loop learning aims to modify and adapt firm-wide behaviors to effectively treat the underlying cause. We expect that firms may use a flexible response strategy when the number of near-misses are low. As the number of near-misses increase, the number of exceptions increases and the managers may look for underlying reasons as to why these near-misses may happen. Consequently, we expect a shift in strategy to procedural response strategy as the number of near-misses increase.

Organizational learning does not take place in isolation but is heavily influenced by institutional contexts. We investigate the role played by institutional pressures on the effects of exposure to near-misses (DiMaggio and Powell, 1983). We combine the theoretical arguments noted above with empirical results using statistical analyses to offer empirical evidence on the research question. By doing so, we assess the general and nuanced effects of considering near-misses in managing supply chain disruptions and thereby determine its effectiveness as a mitigation strategy in enhancing supply chain resilience (Bode et al., 2011; Riley et al., 2014; Tomlin, 2006). The next section offers background information on near-misses from a broad and focused perspective.

Risk management theoretical lenses – A review

Organizational scholars and engineering researchers have examined risk management and proposed different theoretical lenses. Whereas we cannot summarize all the theoretical lenses, we provide background on three main theoretical lenses that have been employed by management scholars – NAT, Swiss cheese model, and HROs.

NAT, proposed by Perrow (1994) and Sagan (1995), postulates that accidents should be expected in any system. Moreover, the rate and the magnitude of accidents are dependent on the degree of coupling between the system's components and the complexity of the system. Tight coupling between components contributes to the propagation of failures. In a complex system with a large number of potential interactions, the potential for unanticipated failures increases dramatically (Sagan, 1995; Wolf, 2001). NAT has been applied in supply chain research when examining the traceability of adverse events in complex supply chains and supply chain disruption propagation (Scheibe and Blackhurst, 2018; Skilton and Robinson, 2009). However, some have called into question the applicability of this theoretical lens in contexts where failures occur in systems with loose coupling or low complexity environments (Hopkins, 1999; La Porte and Rochlin, 1994; Leveson et al., 2009).

The Swiss cheese model, proposed by Reason (1977), postulates that systems can have multiple defensive layers to protect against potential failures. These defensive layers can either rely on the systems' infrastructure or (constituting hard defenses) or rely on people (constituting soft defenses) to determine ways to address potential issues that can lead to failures (Hosseinian and Torghabeh, 2012; Reason, 1977). While no defense layer is perfect on its own, the combination of layers helps compensate for any particular layer's shortcoming. Similar to layers in Swiss cheese, weaknesses (or holes) are covered by other layers. However, sometimes, the errors in all layers can align perfectly to cause a major failure. Conditions for such alignment can lay dormant for many years "before they combine with active failures and local triggers to create and accident opportunity" (Reason, 2000; pp 769). Proponents of this model point to famous accident in Chernobyl nuclear disaster to illustrate that each layer on its own could have localized the damage, but it was the perfect alignment of the layers that resulted in a disaster of such magnitude.

An interesting paradox of the above theories is that they help in recreating the causes that lead to catastrophic disasters but do not provide direction on how to avoid conditions that can lead to these failures (Reason, 2000). Consequently, management scholars studied risk management by examining how HROs perform (Coutu, 2003; Roberts, 1990). HROs, such as nuclear power plants, air traffic control, aircraft carriers during peace time, firefighting teams, focus on the safety of operations that can result in highly reliable operations (Leveson et al., 2009; Roberts, 1990). The accident rates in these organizations are very low, despite operating in conditions where we should expect high incidences of failures. Researchers found that HROs incorporate redundancies, loose-coupling and simulated drills to hone their ability to detect and manage failures (Leveson et al., 2009). Leveson et al. (2009) argue that HRO routines may not be applicable to other organizations because HRO processes are stable and the focus of an HRO organization is not on improving efficiencies but rather on ensuring safety. Although firms can learn from these organizations, the lessons may not be directly applicable to firms that do not emphasize safety as their main mission (Weick et al., 2008). Further, some HRO researchers have argued that typical organizational processes proposed by organizational researchers may not be applicable to HROs because they are fundamentally different from typical firms (Roberts, 1990).

The above theories focus on catastrophic failures. Although they are inevitable, they are not as common as other indicators of failures such as near-misses (Sagan, 1993; Skilton and Robinson, 2009). Table 1 (Part 1) provides a summary of the literature on near-misses across different fields of scientific inquiry. As can be seen, a substantial number of publications on near-misses is in medical sciences, followed by psychology/neurology, engineering and healthcare operations. A common acknowledgment across these scientific streams is that the study of near-misses can improve error identification. Major errors happen too infrequently to develop reliable generalizations from them. Instead, the fact that near-misses happen more frequently provides an opportunity for identifying patterns and root causes of potential systems related issues. A second commonly noted matter across these fields is that effectively identifying and reporting of near-misses is a challenge in almost all settings. To start, identifying near-misses requires a subjective interpretation of a series of events that resulted in no observable negative outcome. It is the observer who has to interpret these events as a sign of potentially larger issues. Literature in safety science suggests that it is not uncommon for plant management to dismiss near-misses as 'unique,' and 'nonreplicable' events (Baumard and Starbuck, 2005). Another important observation from safety science and crisis management is that near-miss reporting is discouraged as a result of organizational culture and organizational bureaucracies (Barach, 2000).

--- Insert Table 1 About Here ---

Table 1 (Part 2) provides a focused view of the literature on near-misses as related to supply chain disruptions. In a supply chain context, the focus is on events that pertain to the inter-organizational exchange of goods, services, funds, and information (Bode and Macdonald, 2016). By definition, supply chain near-misses leave no injuries, and no property or equipment damage (Williamsen, 2013). Given the focus on efficiency and productivity in supply chain operations, near-misses are often ignored because they carry low relevance and low potential impact (Lampel et al., 2009). For some, the potential for near-misses is presumed to be part of the risks of doing business, thereby suggesting that there may be no need to report such divergences from the norm (Juttner et al., 2003). Nevertheless, this literature stream echoes the call made by others: Information gained from near-misses can help introduce structural and behavioral changes that could prevent such catastrophes by terminating the root cause of the problem. However, as Table 1-Part 2 suggests, empirically based investigations about the benefits of near-misses are scant. Only a handful of studies have explored how experiencing near-misses relate to firm behavior or strategy, especially as related to supply chain disruptions.

Theory

Argyris and Schön differentiate between an organization's learning approach based on two clusters, those using Model I and those using Model II (Argyris and Schön, 1974). Model I tends to lead to single-loop learning, which relies on a simple problem-solving process. Although single-loop learning is adaptive, it does not focus on treating the cause; rather it looks for an expeditious solution. While errors are corrected, the underlying issues remain (Stead and Smallman, 1999). Model II leads to double-loop learning, which involves comparing the situation with existing organizational practices, questioning whether these practices are still viable, and justifying whether the company should modify them. Unlike single-loop, double-loop learning involves adaptation and modification of firm-specific competencies and routines (Argyris and Schön, 1974). The contrast between single and double-loop learning is particularly nascent for studying supply chain risk and disruption management. Indeed, organizations improve by learning and correcting their errors (Argyris, 1976). In the sections following, we will relate the theoretical explanations provided by Argyris and Schön to offer hypotheses on the effects of near-miss exposure to flexible and procedural response strategies.

What organizations focus on to learn about may be influenced by institutional forces. Indeed, organizational learning can be initiated by disparate external forces. The institutional theory explains how the scope for organizational learning can be rendered through the influence of societal values and structures, which act as "learning triggers" (Scott and Meyer, 1994; Weick, 1991; Zsidisin et al., 2005). Often associated with coercive pressures, government regulation, is one form of institutionalization (Hoffman, 1999). Another learning trigger may be normative pressures in the form of industry and professional standards. Industry pressures link normative institutional forces to organizational learning because they are based on educational programs, professional requirements and often scientifically driven industry standards.

Hypotheses

Near-misses and supply chain disruption response strategies

A flexible response orientation is built on the assumption that disruptions are fluid and ever-changing events. Plans for addressing supply chain disruptions needs to be adjusted to suit the situation at hand (McEntire et al., 2013; Turner, 1995). In firms with a flexible response orientation, empowered personnel often help find novel solutions to disruptions. For instance, the National Park Service (NPS) firefighters operate in a system that leaves ample room for frontline personnel to act independently and creatively, while still integrating their actions into a coherent and systemic scheme (Weick, 1993). In firms with a flexible response orientation employees close to near-misses could be encouraged to engage in self-initiated and often novel means to address the issue, even if their solutions result in developing "work-around" processes that are not in line with the protocol (Dillon et al., 2014; Weinstein, 1989). Some employees may develop quick-fixes to address the issue and carry on with their work. Others may become more confident about their ability to address the issues independently and creatively because of their repeated experiences (Jeffs et al., 2012).

In line with single-loop learning, employees and managers in firms with a flexible response orientation close to the issue would try to address the issue using quick-fix resolutions.

For instance, in cases where financial issues with a supplier place it close to filing for bankruptcy and expose the buyer company to a potential shortage of material, those in charge may simply offer a "bridge-loan" to the supplier to fix the immediate matter (Muermann and Oktem, 2002; Tessmer, 1997).

Unlike the NPS, Forest Service (FS) firefighters operate "by the book" (Weick, 1993). FS firefighters have a procedural response strategy (Deverell and Olsson, 2010). Focusing on procedures allows such organizations to develop reliable protocols to consistently address potential disruptions (Seifert, 2007). Activities commonly seen in procedurally focused organizations include adhering to a schedule to complete tasks, conducting meetings with specifically defined memberships and agenda, and generating and compliance to planning documents (John and Martin, 1984).

Rising frequency of near-misses can raise an organization's concern about them. The recurrence of similar and potentially related near-misses, and more salient information about their potential damage tends to raise perceptions of their seriousness and may prompt personnel to further scrutinize them (Tinsley et al., 2012). To start, frequent near-misses leads to the need for a more thorough and systematic review and analysis of such close-calls (Andriulo and Gnoni, 2014; Lampel et al., 2009). This rising pressure may require those responsible for the future performance of the company to carefully study the root causes of near-misses and apply rules and procedures to address them. Further, employees may be discouraged to solve problems in an ad-hoc manner, i.e., employ a flexible response strategy. Increased frequency also makes it easier to spot commonalities among near-misses (Wright and van der Schaaf, 2004). This facilitates the possibility of systematically addressing the near-misses by implementing procedures that can address several issues at once (Peck, 2005), i.e., use of procedurally oriented response strategy.

When addressed at the systems level, lessons can be disseminated beyond the local circumstance and can benefit a broader circle.

Based on double-loop learning, we argue that with frequent near-misses, organizations become aware of the underlying causes of potential errors and thus lean towards a procedural strategy. A highly-referenced example of lingering root causes comes from the railroad industry: the devastating Paddington rail disaster of 1999. As explained by Kleindorfer et al. (2012), in this case, safety signals were ignored on numerous occasions, which eventually led to the fatal crash. This event and similar major failures eventually led to broadly applied changes in the railroad industry. In today's Germany, for instance, automatic control systems and speed checks are commonplace in commercial and cargo trains. This, in essence, is the application of double-loop learning to help combine lessons from anomalies to treat the underlying causes of accidents (Argyris, 1976). Therefore:

> *H1a+b: Exposure to near-misses is a) negatively associated with flexible response strategy and b) positively associated with procedural response strategy.*

Moderating Effects of Institutional Pressures

Regulatory bodies in a number of industries require companies to record, analyze and report near-misses. For example, in clinical trials supply chains, pharmaceutical companies are required to demonstrate how they address emerging issues that can hamper their operations and their ability to adopt a system-wide response protocol (European Medicines Agency, 2015). In this and other industries, regulations act as coercive pressures that force companies to adjust their behaviors in order to avoid sanctions, prevent restrictions on their market access and to gain legitimacy to ensure their long term competitiveness (Muermann and Oktem, 2002).

The coercive effects of regulatory pressures can positively augment the firm's emphasis on strengthening their response strategies. Regulatory pressures can comprise instructions that may lead to flexible or procedural strategies. For instance, similar to the examples provided above, companies may be required to not only install near-miss tracking systems but also be able to act quickly to sudden and emergent concerns such as news of broad product contamination or supply shortage issue. Pressure from regulatory entities may also lead to companies to take near-misses more seriously and to reflect their experiences with these events in their response strategies. Indeed, the positive influence of regulatory forces can be seen in industries exposed to a larger level of scrutiny and governmental regulatory protocols. The discussion above leads to the following hypotheses:

> *H2a+b: Institutional pressure from regulatory bodies increases the association between exposure to near-misses and a) flexible and b) procedural response strategy.*

Industrial associations and professional standards carry normative pressures on organizational behavior (Scott, 2001). Unlike coercive forces, normative pressures are developed as a result of shared education, frames of mind and overall professional experience. For instance, the electronics industry has formed a coalition among manufacturers that provides a forum to discuss the risks associated with issues such as child labor, environmental pollutions, sustainability and other social and supply chain matters (Vogel, 2010). Professionals working for companies engaged with the Electronic Industry Citizenship Coalition (EICC) become acclimated with norms and protocols that other companies are using. As a result, these professionals are better aware of the underlying severity associated with near-misses. It follows that they may be more prone to react to these situations at the local level by developing ad-hoc disruption solutions.

Through industry associations, professional education and other related normative forces, managers may be influenced to better identify, analyze and make use of near-miss incidents. Managers might not only be influenced to carry skills and awareness as tools to identify a near-miss and to quantify them, but also have the awareness that near-misses will not be left unnoticed or ignored. It is also possible that managers may learn to consider near-misses as "complimentary" lessons because no harm was materialized from the event, and that they actually might help surface root cause of larger systemic issues. We thus argue that firms in industries with high normative pressure will pursue higher levels of procedural and flexible disruption responses.

> *H3a+b: Institutional pressure from industry increases the association between exposure to near-misses and a) flexible and b) procedural response strategy.*

Research methodology

Sampling frame and Non-response bias

We targeted senior executives and managers involved in supply chain partnerships in manufacturing firms and limited our respondents to NAICS industry codes in manufacturing (32 and 33). An identical procedure was used to collect data from manufacturing firms in Sweden, Switzerland, and Germany. We randomly selected 1,000 firms in each country using the following databases: Statistics Sweden's register of Swedish firms: Economic Statistics Department and Affärsdata, European databases EPO, the Federation of the Swiss Watch Industry (FH), German Institute for Economic Research (DIW) Berlin and the Chamber for Industry and Commerce. We excluded multinational firms from the sampling frame. We screened and eliminated duplicates firms that may be in multiple databases. We followed the procedure recommended by Dillman (1991) and sent direct mail questionnaires. Following a four-wave mailing, 448 usable questionnaires were produced reflecting a response rate of approximately 14.9 percent. As related to non-response bias, we compared the first and second wave respondents on the key variables of the study. The tests did not reveal any statistically significant differences ($p < 0.05$), indicating that there were no issues with non-response bias.

Measures

We define a near-miss event as an occasion where the company comes close to being affected by a supply chain disruption, but it was not. Our questionnaire asked about the number of near-misses occurring at a facility. This premise (frequency of near-misses) is a common measure in similar studies in medical establishments (Wahlberg et al., 2013) operational safety (Jones et al., 1999) and transportation (Groeger and Chapman, 1996) among others. We measured the frequency of near-misses that were initiated by different sources separately and combined them (upstream suppliers, internal functions, downstream customers and sources external to supply chain). We measured regulatory pressure using four items to evaluate how federal and local agencies stipulate firms to develop crisis management plans and business continuity plans. We expanded on the definitions provided on regulatory pressure and adapted it to the context of supply chain disruptions (Zsidisin et al., 2005). Similarly, we measured industry pressure using items to evaluate how industry standards and trade associations provide influence development of crisis management plans and business continuity plans (Grewal and Dharwadkar, 2002; Zsidisin et al., 2005).

We developed items for flexible response strategy based on two relevant studies (McEntire et al., 2013; Turner, 1995) that measure how organizations adapt and improvise existing plans based on the uncertainty of the situation. We developed measures for procedural response strategy from formalization literature (Sivadas and Dwyer, 2000; Tenhiälä and Salvador, 2014) and adapted them to the context of disruption management.

--- Insert Tables 2 & 3 About Here ---

Controls

To control for contextual factors, we included several measures. We included firm age product maturity and firm size (*Ln* Number of employees) to control for the culture of the organization (Azadegan and Wagner, 2011; Li et al., 2015; Wei et al., 2017),. Older firms may have established processes that have been instituted over time. Also, firms with more mature products are typically associated with greater cost-leadership, which requires rigid processes to control the efficiency of outputs (Brumme et al., 2015; Gupta and Lonial, 1998). Similarly, larger firms tend to institute processes to address various exception scenarios during their day-to-day operations. We included industry to control for industry level factors that may influence firms to institute procedural response strategies. For instance, firms in pharmaceutical industries are subject to external regulatory factors that may require firms to institute procedural response strategies more than flexible response strategies. We included supply chain position and environmental dynamism to control for any structure related factors that may require firms to pursue one strategy over the other (Demeter, 2014; Kinra and Kotzab, 2008). We used dummy variables to control for country because the data were collected in different countries. Finally, we controlled for small disruption frequency because firms with greater frequency of small disruptions may institute processes and strategies to address these issues.

Measure validation

We used confirmatory factor analysis (CFA) to assess the unidimensionality of the constructs. We assessed the measurement model fit using a chi-squared statistic (χ^2), comparative fit index (CFI), the goodness of fit index (GFI), Bentler-Bonett normed fit index (NFI), Tucker-Lewis index (TLI), root mean squared error approximation (RMSEA) and standardized root mean square residual (SRMR). The confirmatory factor analysis yielded χ^2 (253) = 818.571; RMSEA = 0.071; SRMR = 0.050; CFI = 0.929; GFI = 0.873; TLI = 0.916. The model fit indices were above the recommended thresholds (Hu and Bentler, 1999). This indicates that the measures for latent variables are acceptable. We also assessed reliability, convergent validity and discriminant validity of the constructs. Detailed statistics on loadings, reliability, and AVEs are presented in Table 3.

Common method bias

To dampen the effects of common method bias, the survey was designed using different scale formats and anchors for the key variables. In addition, we tested for common method bias in the following ways. First, we conducted a version of Harman's one-factor test to verify that there is no bias in results because of a single respondent. We followed the methodology suggested by Malhotra et al. (2006) and also used the marker-variable technique (Lindell and Whitney, 2001) to test for common method bias. Based on these tests we conclude that common method bias is not significant in our dataset.

Analysis and results

We tested our hypotheses using hierarchical regression models (Table 4). We first introduced the control variables (model xM1), then we introduced variables to assess the main effects (models xM2), then we introduced interaction terms (models xM3 and xM4). Finally, we introduced all the variables (model xM5).

Focusing on the results on the left-hand side of Table 4, model FM2 shows that the frequency of near-misses ($p < 0.01$) is negatively related to flexible response. This supports our hypothesis H1a. The interaction term "NM x Reg. Pressure" (model FM3) is statistically significant providing support for hypothesis H2a. Finally, the results in model FM5 show that "NM x Ind. Pressure" is positive and statistically significant ($p < 0.05$), providing support for hypothesis H3a. We plotted the interaction graphs of these results in Figure 1 (1-1 and 1-2). We discuss the implications of these results in the next section.

--- Insert Figure 1 About Here ---

Focusing on the results in the right-hand side of Table 4, model PM2 shows that the frequency of near-misses ($p < 0.001$) is positively related to procedural response. Thus, hypothesis H1b is supported. We tested hypothesis H2b by introducing the interaction term "NM x Reg. Pressure" (PM3) in the regression equation. The results show that the interaction term is not statistically significant; thus, hypothesis H2b is not supported. The results show that the regulatory pressure has a positive effect ($p < 0.05$) on the procedural response. Finally, the results in model PM5 show that "NM x Ind. Pressure" is positive and statistically significant ($p < 0.05$), providing support for hypothesis H3b. We plotted an interaction graph (Figure 1-3) to illustrate the moderating influence of industry pressure on the relationship between near-misses and procedural response.

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Discussion

Our research question in this study investigates whether exposure to near-misses reflects in organizational response strategies to supply chain disruptions. Our results offer empirical evidence worthy of note. As hypothesized, exposure to near-misses is associated with a rise in procedural response strategies. This is an interesting finding, considering that (as explored earlier in the paper) strong factors challenge the reporting and institutionalization of lessons learned from near-misses. It is encouraging to see that in general, firms are able to digest this information and develop proactive risk mitigation processes. This finding is in contrast to studies in neuroscience (Clark et al., 2009) and management research (Dillon and Tinsley, 2008) that find that following near-miss events, individuals/managers tend to lower their perceived risk level and raise the desire to take risks. These findings suggest that managers may pursue riskier alternatives, as a result of exposure to near-misses. In our study, conducted at the organizational level, the results suggest that exposure to near-misses leads to more procedural and systematized approaches to how disasters are handled. In other words, at the organizational level, exposure to near-misses may limit the propensity to choose riskier propositions. Given that organizational decisions are likely to involve discussions and resolutions to differing opinions (Cyert and

March, 1963), exposing and studying near-misses leads firms to take on more cautious, and procedural approach to potential supply chain disruptions.

Second, and interestingly different from our theoretical arguments, results suggest that with increased exposure to near-misses, companies lower their application of flexible response strategy. In many cases, near-misses are likely to be recognized and addressed by those in the immediacy of the issue; at the departmental levels. As we explained in earlier sections, one would expect a rise in personnel awareness, which is likely to result in ad-hoc and localized solutions to rise when facing similar circumstances. Indeed, studies related to hospital operations explore how near-miss, and small disruptions are more often addressed at the local level (Tucker and Edmondson, 2002). The fact that exposure to near-misses is significantly related to lower flexible response strategy suggests that, as related to supply chain disruptions, firms tend to shy away from emphasizing localized and emergent resolutions of such issues.

From an organizational learning perspective, the collection of insights from this study regarding flexible and procedural response strategies can seem interestingly paradoxical. Organizational learning theory often suggests that firms are more influenced by myopic and short term decision preferences and often discount the long term possibilities of their experiences (Azadegan and Dooley, 2010; Levinthal and March, 1993). The myopia explanation on organizational learning would imply that companies would react to more near-misses by increasing the use of their short-term learnings; implying a rise in the use of flexible response strategies. In contrast, we find that exposure to more near-miss events raises considerations for a more long-term and systemic view of the issues by implementing procedural response strategies. The results here suggest that, as related to disruption response and risk management, organizational behavior may be more complicated than expected. Indeed, while single and double-loop learning may take place at the same time, when near-misses increase, the primacy of double-loop learning can be more pronounced.

Our study clarifies how regulatory and industry pressures place a significant, yet distinct influence on the effects of exposure to near-misses. With increased exposure to near-misses, regulatory pressure helps to lower the emphasis placed by firms on flexible response strategy. This may be explained by the fact that firms facing substantial regulatory expectations must refrain from ad hoc and emergent decisions, perhaps because such response strategies may seem less organized and in contrast to governmental expectations. Interestingly, the influence of regulatory pressures as a moderator on procedural response was not significant. This finding could be explained by the fact that broadly enforced regulations requiring documentation of near-misses has yet to be broadly implemented except in a handful of industries (Phimister et al., 2003).

Specific to flexible response strategy and institutional pressures as moderating factors, we see a picture consistent with that of findings from direct effects. Industry pressure thwarts the negative association between near-miss exposure and flexible response strategy (Figure 1). Whereas frequent near-misses lead to lowered flexible response strategy and moving away from localized decision making, industry pressure helps maintain some of the focus on flexible response. The contrast between the effects of industrial and regulatory pressures on the procedural response is also interesting. Unlike regulatory pressure, industry pressure further attenuates using procedural response with exposure to near-misses (Figure 1). Arguably, the influence of normative pressure (i.e., inclination to look to a network of professionals and industry-based standards for legitimacy) seems to be a more effective than the influence forced by the need to conform to regulations at the risk of sanctions and penalties.

Combined, these results strongly support that, as related to supply chain disruptions, it is important to consider the role of external constituents in organizational learning. Results also suggest that the upcoming stream on learning and knowledge exchange in supply chains (Blome et al., 2014; Handfield et al., 2015) should further extend their focus to non-traditional supply chain members (e.g., industry bodies, regulators). Firms are not only encouraged by their constituents to pay close attention to learning from near-misses, but those that do pay attention are likely to improve their crisis management response strategies.

By combining institutional theory and institutional learning, the findings here provide interesting explanations on how different institutions trigger learning patterns. One potential reason for these varied results may be that tracking near-misses, as related to supply chain disruptions, is not widely enforced. Interestingly, industrial norms and practices seem more effective in this regard than regulations. This finding is in contrast to research on environmental practices, which has showcased how regulatory pressure leads firms to implement practices that they otherwise would only symbolically address (Short and Toffel, 2010). It has also been shown that industry-based interests (e.g., provided through contractual partners) can be important to nurture activities that go beyond compliance and lead to committed implementation (Blome et al., 2015).

Conclusion & Contribution

As of late, the literature on supply chain risk has highlighted the importance of supply chain resilience in facing disruptions (Blackhurst et al., 2011; Craighead et al., 2007; Pettit et al., 2010). In this study, we enquired as to whether exposure to near-misses can help companies refine their response strategies in facing supply chain disruptions. Judging from the focus that many industry leaders place on near-misses, the question should be of interest to practitioners and researchers alike. Theoretically, organizational learning scholars suggest that companies can learn from these *close-calls* to better prepare for and limit the potential for larger size disruptions.

While earlier studies in other fields offer mixed findings on the learning potentials from near-misses, we find that firms do indeed learn significantly from such events.

Beyond extending previous findings about near-misses to the supply chain context, this study offers other contributions to research and practitioner fields. To start, this work offers theoretical arguments and empirical evidence on how companies learn from and incorporate their learning. Specifically, the fact that near-misses are important influences on the second order, and arguably long term, learning approaches by companies is a contribution that can be benefited from by researchers and practitioners in supply chain management.

Contribution to organizational theory stems from the effort to combine two theories often applied to explain very dissimilar phenomena in tandem. As we noted above, organizations do not learn in a vacuum and what they focus on learning about is contingent on external pressures. With regards to institutional pressures, we extend research by highlighting how, to our surprise, forceful and coercive pressures based on authoritative voices may be less effective. Instead, the influence of one's industrial comrades may be more potent.

Limitations & Future Research

Findings in this study should be considered alongside their potential limitations. First, near-misses are ambiguous phenomena that may be documented using different methods. We measured near-misses using a count variable. Future research may consider looking at differentiating near-misses based on their source, level of potential impact and the possible probability of leading to actual disruptions. Second, we focused on only two important institutional pressures. Future studies may consider incorporating external pressures that represent mimetic pressures, such as that related to competitors.

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Table 1 – Part 1: Literature on near-miss across scientific disciplines (The Broad View)

Fields of Science and Article Count			Notable Articles	Related Insights
Medical Science		**478**		Near-miss reporting offers numerous organizational benefits. By collecting near-misses medical science can better understand recovery patterns through the capture, study, and improvement of discovery processes.
General Medicine	Pediatrics, Internal Medicine, Gynecology	279		
Medical Disorders	Hepatology, Oncology, Respiratory	90	Barach et al. (2000)	
Basic Medical Research	Hematology, Pathology, Immunology	55	Fairbanks et al. (2008)	
Pharmacology	Toxicology, Substance Abuse	54		
Psychology & Neurology		**136**		Cognitively, near-miss events influence behavior by "recruiting brain areas" triggering loss aversion and thus increasing motivation to try again. In organizations, frequency in near-miss reporting can be increased with improved culture and upper management involvement.
Applied Research	Psychiatry, Clinical Psychology	56	Mearns et al. (1998)	
Basic research - Behavioral	Experimental/Mathematical Psychology	52	Clark et al. (2009)	
Basic Research - Anatomical	Neuroimaging, Neuroscience	28		
Engineering		**135**		Near-miss evaluation can be effective accident pre-cursor data in production systems as they can help identify underlying causes that could be controlled by management.
Production systems	Industrial, Civil, Mechanical	116	Bier (1990)	
Biological systems	Ocean and Marine	19	Fabiano et al. (2012)	
Healthcare Operations		**133**		Near-miss analysis can help with recognition and analysis of errors, determination of patterns of errors, and monitoring for changes in frequency after corrective action is implemented.
Critical Care	Critical Care, ER, Radiology	42	Clarke et al. (2002)	
Nursing and Surgery	Transplantation, Healthcare services	91	Callum et al. (2001)	
Public Health Policy	Public Health, Urban studies	**95**	Storeng et al. (2010)	Near-misses avert fatal loss, but also carry severe ramifications on the affected.
Safety Literature	Occupational safety, Haz Mat	**80**	Carroll (1998)	Frequency of near-misses can increase because of ineffective work procedures
Emergency Mgt.	First Responder Reporting	**20**	Wright et al. (2004)	Organizational culture may discourage sharing findings among EMS.
Operations Mgt.	Decision Science, Org Learning	**18**	Dillon et al. (2008)	Interpreting near-misses as successes may make managers less risk-averse.
Transport Systems	Traffic Studies, Transport Technology	**18**	Goerlandt et al. (2011)	Recognized accident risk factors are also attributed to near-miss events.
Finance & Economics	Bankruptcies, Credit Risk	**6**	Tessmer (1997)	Studying near-misses helps with predictive accuracy of credit-risk assessment.
Supply Chain Mgt.	See Part 2			

Table 1 – Part 2: Literature on near-miss across scientific disciplines (Focused view - Supply chain management related fields)

Study	Relevant Findings	Type of Risk	Industry
Muermann & Ulku (2002)	Analyzing near-misses can be a risk-reduction tool in assessing financial viability of firms.	Operational risk	Banking
Phimster et al. (2003)	An effective near-miss program emphasizes dissemination and resolution of reported cases.	Production/environmental	Chemicals
Wright & vd Schaaf (2004)	Supports to the "common cause" hypothesis; near miss and accidents have same root issues.	Safety/Production	Transportation
Peck (2005)	Explains how near-miss events can help highlight previously unrecognized risks.	Operational (Conceptual)	
Handfield et al. (2007)	Companies are more willing to invest in supply chain redesign post near-miss events.	Operational Risk	Multiple Industries
Kim & Miner (2007)	Learning from near-misses in banking improves performance.	Bank Failures	Financial markets
Pettit et al. (2010)	Near-miss analysis is a form of adaptive resilience capability.	Operational risk	Multiple Industries
Tinsley et al. (2011)	Offers anecdotal cases on how attention to near misses can predict and prevent crises.	Operational risk	Multiple Industries
Dillon et al. (2011)	Near-miss experience with hurricanes leads to over-confidence.	Natural Disasters	Housing
Kleindorfer et al. (2012)	Details near-miss management system and justifies how it can improve profitability.	Process Safety	Multiple Industries
Williamsen (2013)	Offers explanations as to why near miss reporting is missing in many organizations.	Worker Safety	Multiple Industries
Dillon et al. (2014)	Near-miss reporting is contingent on a positive safety climate	Natural Disasters	Housing
Andriulo & Gnoni (2014)	Areas with higher error rate have lower tendency to report near miss events.	Worker Safety	Auto Industry
Sheffi (2015)	Offers anecdotal examples of how companies use near-miss to improve performance.	Operational risk	Multiple Industries
Habermann et al. (2015)	Near-misses (*Close calls*) are one form of disruption risk.	Operational risk	Multiple Industries
Mellat-Parast et al. (2015)	How airlines address minor service failures depends on their strategy.	Operational risk	Airlines

Table 2: Correlation matrix

	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Procedural Response	4.08	1.19									
(2) Flexible Response	3.71	1.29	0.124**								
(3) Firm Age	3.52	2.39	-0.210***	-0.133**							
(4) Product Maturity	3.56	0.98	-0.102*	0.071	0.128**						
(5) Ln Number of Employees	5.03	0.49	-0.079†	-0.107*	0.079†	-0.006					
(6) Environmental Dynamism	3.36	0.94	-0.089†	0.083†	0.069	0.450***	-0.078†				
(7) Frequency of Small Disruptions	3.64	1.09	0.331***	0.202***	-0.339***	-0.096*	-0.061	0.001			
(8) Frequency of Near Misses	3.45	1.36	0.589***	0.002	-0.156***	-0.175***	-0.064	-0.181***	0.215***		
(9) Regulatory Pressure	2.82	1.01	0.068	0.145**	0.033	0.258***	0.004	0.429***	0.085†	-0.095*	
(10) Industry Pressure	4.12	0.92	0.054	0.050	0.126**	-0.054	-0.022	0.061	-0.169***	0.128**	0.050

† $p \leq 0.10$; * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

Table 3: CFA Model Fit and Item Loadings

Construct	Item code	Item	Std. loading	CR; AVE
Procedural response	PR1	Use of established policies and procedures play a major role	0.841	0.897; 0.685
	PR2	How past disruptions have been managed is documented and referred to	0.779	
	PR3	Role, responsibilities and ownership of problems are rigidly followed	0.838	
	PR4	Allocating resources is through formalized requests and approvals	0.852	
Flexible response	FR1	Ad-hoc and emergent decisions are relied upon heavily	0.793	0.912; 0.722
	FR2	Plans are adjusted and modified throughout the course of a disruption	0.913	
	FR3	Decisions are made based on the situation at hand	0.907	
	FR4	Following the chain of command takes a back seat to quickly addressing the disruption	0.777	
Near misses	NM1	Initiated because of actions or decisions of your suppliers and came close to severing your operational flows.	0.924	0.937; 0.789
	NM2	Initiated in your organization and affected upstream and downstream members of the supply chain without stopping or significantly slowing down their production.	0.899	
	NM3	Initiated because of actions or decisions of your downstream customers and affected your operations without stopping or significantly slowing down your production.	0.920	
	NM4	Initiated as a result of other factors and affected more than one member of your supply chain without stopping or significantly slowing down their production.	0.805	
Industry pressure	IP1	Industry standards influence our implementation of a Crisis Management Plan.	0.861	0.902; 0.756
	IP2	Generally agreed upon practices of our trade associations' influence our implementation of a Business Continuity	0.940	
	IP3	Generally agreed upon practices of our trade association's influence our implementation of a Crisis Management	0.801	
Regulatory pressure	RP1	Our local regulations influence our implementation and update of a Business Continuity Plan.	0.878	0.847; 0.589
	RP2	Our local regulations influence our implementation and update of a Crisis Management Plan.	0.626	
	RP3	Our federal (country level) regulations influence our implementation and update of a Business Continuity Plan.	0.920	
	RP4	Our federal (country level) regulations influence our implementation of a Crisis Management Plan.	0.590	
Small disruptions	SD1	Initiated in your organization and affected upstream and downstream members of the supply chain.	0.749	0.879; 0.709
	SD2	Initiated because of actions or decisions of your downstream customers and affected your operations	0.965	
	SD3	Initiated as a result of other factors and affected more than one member of your supply chain.	0.797	
Product Maturity	PM1	Our products are mature (are in the late stages of product innovation life cycle).	0.841	0.877; 0.704
	PM2	We operate in a market that has been well established in terms of competitors.	0.869	

PM3	In general, our products can be described as commodity rather than as distinctively novel.	0.805
Chi-square (DF) = 818.571 (253); RMSEA = 0.071; SRMR = 0.050; CFI = 0.929; GFI = 0.873; TLI = 0.916		

Table 4: Regression Results for Flexible and Procedural Response

	Stepwise Regression for Flexible Response Strategy					Stepwise Regression for Procedural Response Strategy				
Variable	FM1	FM2	FM3	FM4	FM5	PM1	PM2	PM3	PM4	PM5
Country Dummy	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Firm Age	-0.009 (0.030)	-0.008 (0.029)	-0.007 (0.029)	-0.010 (0.030)	-0.011 (0.029)	-0.013 (0.026)	-0.009 (0.021)	-0.014 (0.020)	-0.007 (0.020)	-0.011 (0.020)
Product Maturity	0.094 (0.081)	0.079 (0.080)	0.083 (0.081)	0.106 (0.080)	0.103 (0.081)	-0.016 (0.062)	0.029 (0.054)	0.019 (0.054)	0.042 (0.054)	0.029 (0.055)
SC Position Dummy	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry Dummy	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Ln Number of Employees	**-0.272*** **(0.115)**	**-0.270*** **(0.117)**	**-0.322**** **(0.124)**	**-0.255*** **(0.115)**	**-0.296*** **(0.121)**	**-0.214*** **(0.107)**	-0.115 (0.083)	-0.110 (0.086)	-0.111 (0.083)	-0.091 (0.084)
Environmental Dynamism	0.074 (0.074)	0.089 (0.075)	0.029 (0.083)	0.067 (0.078)	0.008 (0.085)	-0.089 (0.061)	0.001 (0.054)	-0.056 (0.058)	-0.008 (0.055)	-0.069 (0.059)
Small Disruptions	**0.199***** **(0.060)**	**0.204***** **(0.060)**	**0.187**** **(0.063)**	**0.207***** **(0.061)**	**0.194**** **(0.064)**	**0.297***** **(0.062)**	**0.202***** **(0.055)**	**0.192***** **(0.055)**	**0.198***** **(0.056)**	**0.185***** **(0.057)**
Near misses		**-0.361**** **(0.126)**	**-0.396**** **(0.120)**	-0.229 (0.142)	**-0.289*** **(0.142)**		**0.458**** **(0.141)**	**0.480***** **(0.138)**	**0.563***** **(0.148)**	**0.634***** **(0.149)**
Near misses Squared		**0.053*** **(0.021)**	**0.058**** **(0.021)**	0.033 (0.022)	0.041 (0.023)		0.000 (0.020)	-0.003 (0.019)	-0.015 (0.020)	-0.024 (0.020)
Regulatory Pressure			0.123 (0.069)		0.127 (0.069)			**0.133*** **(0.052)**		**0.147**** **(0.053)**
NM x Reg. Pressure			**0.129**** **(0.044)**		**0.102*** **(0.047)**			-0.009 (0.043)		-0.049 (0.042)
Industry Pressure				0.125 (0.069)	0.126 (0.067)				0.032 (0.051)	0.019 (0.049)
NM x Ind. Pressure				**0.133**** **(0.044)**	**0.100*** **(0.048)**				**0.099*** **(0.048)**	**0.127**** **(0.044)**
Constant	3.660*** (0.692)	4.170*** (0.729)	4.480*** (0.768)	3.320*** (0.797)	3.620*** (0.826)	4.430*** (0.658)	2.190*** (0.552)	2.100*** (0.564)	1.840** (0.572)	1.650** (0.579)
R^2	0.122	0.137	0.164	0.16	0.179	0.177	0.411	0.42	0.422	0.437
F	5.19	5.07	5.69	5.82	6.14	6.49	16.9	16.2	15.2	15.4

ΔR^2	-	0.015	0.027	0.023	0.042	-	0.234	0.009	0.011	0.026

(1) † $p \leq 0.10$; * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$;
(2) Model *x*M1 – Control; *x*M2 – Direct model; *x*M3 – Regulatory pressure interaction model;
*x*M4 – Industry pressure interaction model; *x*M5 – Combined interaction model
(3) ΔR^2 for models *x*M3, *x*M4, and *x*M5 are in comparison to model *x*M2

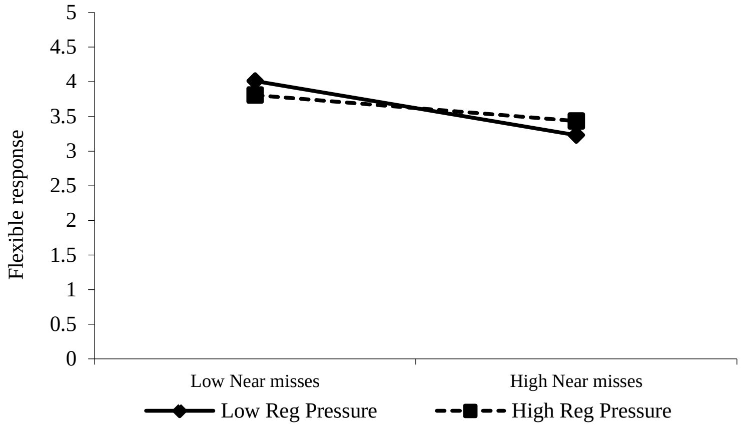

Figure 1-1: Interaction effects of Regulatory pressure on Flexible Response

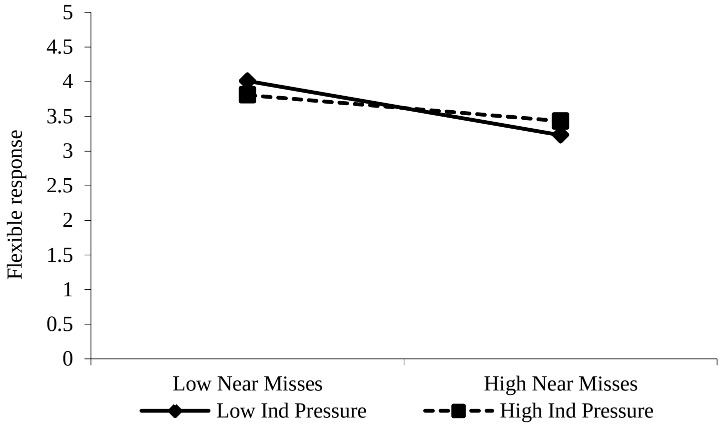

Figure 1-2: Interaction effects of Industry pressure on Flexible response

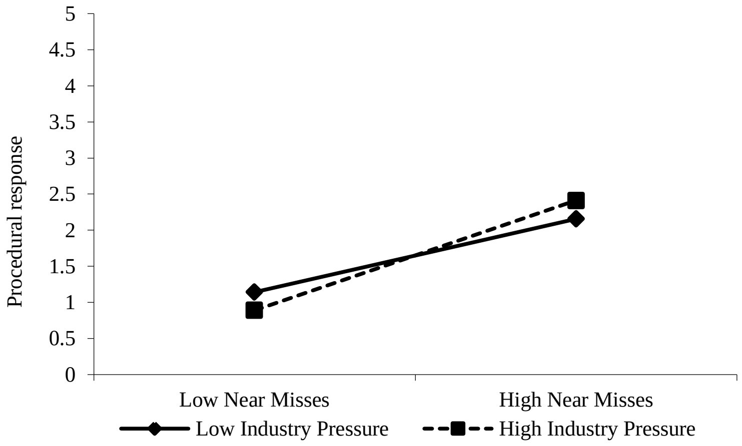

Figure 1-3: Interaction effects of Industry pressure on Procedural response

Figure 1 – Interaction Effects of Regulatory/Industry Pressure on Response Strategies

Appendix A: Questionnaire used to collect data

Consider the following examples of small disruptions:
1) Parts shortages by a JIT supplier causes minor production downtime for you, the manufacturer.
2) Production scheduling error by you, the manufacturer causes the supplier to have to shut down its line for few hours.
3) Weather related issues delay delivery of multiple supplier parts, causing production shutdown.
4) A sudden surge in electricity usage causes you, the manufacturer to lose production for several hours.

Note that in all of the cases, the flow of (a) goods, (b) information and (c) funds is severed for a limited time so as to have a recordable negative effect on an operation. How many similar disruptions does your operation face in **a typical month** that are:
1) Initiated because of actions or decisions of your suppliers and severed your operational flows. _______________
2) Initiated in your organization and affected upstream and downstream members of the supply chain. ___________
3) Initiated because of actions or decisions of your downstream customers and affected your operations __________
4) Initiated as a result of other factors and affected more than one member of your supply chain. ___________

Consider the following examples of near-misses:
1) Parts shortages by a JIT supplier could have caused minor but costly production downtime for you, the manufacturer, but was diverted by using an alternate part.
2) Production scheduling error by you, the manufacturer, could have caused the supplier to have to shut down its line for few hours but was diverted.
3) Because of weather related issues and delayed the delivery of multiple supplier parts was delayed and your production came close to slowing down.
4) A sudden surge in electricity usage could have caused the manufacturer to lose production for several hours but the matter was diverted.

Note that in all of the above cases, the flow of (a) goods, (b) information and (c) funds is not severed, but affected their operation without stopping or significantly slowing down their production.
1) Initiated because of actions or decisions of your suppliers and came close to severing your operational flows. __________
2) Initiated in your organization and affected upstream and downstream members of the supply chain without stopping or significantly slowing down their production. __________
3) Initiated because of actions or decisions of your downstream customers and affected your operations without stopping or significantly slowing down your production. ___________
4) Initiated as a result of other factors and affected more than one member of your supply chain without stopping or significantly slowing down their production. ___________

In your organization:	**1 SD**	**2 D**	**3 N**	**4 A**	**5 SA**
Procedural response					
(1) Use of established policies and procedures play a major role	1	2	3	4	5
(2) How past disruptions have been managed is documented and referred to.	1	2	3	4	5
(3) Role, responsibilities and ownership of problems are rigidly followed.	1	3	3	4	5
(4) Allocating resources is through formalized requests and approvals	1	2	3	4	5
Flexible response					
(5) Ad-hoc and emergent decisions are relied upon heavily	1	2	3	4	5
(6) Plans are adjusted and modified throughout the course of a disruption	1	2	3	4	5
(7) Decisions are made based on the situation at hand	1	2	3	4	5
(8) Following the chain of command takes a back seat to quickly addressing the disruption	1	2	3	4	5