



The missing link in disruption management research: coping

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Received: 13 December 2021 / Revised: 13 May 2022 / Accepted: 19 May 2022

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Abstract

The COVID-19 pandemic made it clear that the impact of supply chain disruptions on different organizations may vary widely. Even if different levels of capabilities (agility, adaptability, etc.) may have contributed to the differential in outcomes, organizations need to learn how to harness their capabilities effectively in the face of disruptions. Although there is vast literature on supply chain disruption management, risk management, and resilience, we are not aware of any theory that comprehensively explains the decision-making process for managing disruptions. We argue that coping theory can explain how organizations may channelize resources based on two stages of appraisal to handle long- and short-term disruptions. Borrowing from psychology, we adapt coping theory to disruption management for any organization in any industry. In this paper, we demonstrate how supply chain coping strategies may explain outcomes of several organizations from different industries during the COVID-19 pandemic. We argue that organizations may sustain and even thrive if they adopt the right coping strategies in their context. We present our thesis using the following three themes: (1) We first identify potential demand trajectories organizations may follow during and after the pandemic, (2) We explain how coping strategies adopted by organizations may impact these trajectories, and (3) We present a framework to help the decision makers understand potential positive impact the coping strategies may bring to their organizations in future crises.

Keywords Coping theory · Supply chain · Disruption management · Risk management · COVID-19

1 Introduction

Different events have disrupted our way of life in the past. While some had intense but localized impact (e.g. 2010 Haiti earthquake), others had much wider global reach (e.g. 2011 earthquake in Japan). Yet none of these events drastically affected the demand as well as the supply side of businesses at the same time as the COVID-19 pandemic did. The pandemic affected the world with unprecedented scale. It showed that the world did not learn from the last pandemic,

the Spanish flu that killed millions about 100 years ago. The redundancies built for the sake of resilience (Melnik et al. 2010; Ambulkar et al. 2015; Ivanov et al. 2017) seemed inadequate in the face of the pandemic. Even large corporations with well-rounded risk management perspectives (Tomlin 2006), can have mixed results after two years of dealing with COVID-19. According to Fortune Magazine (Fortune 2020) 94% of the Fortune 1000 companies have been negatively affected from the pandemic, while survey data from 11,000 firms from 28 countries show that some firms adapted to the environment created by COVID-19 better than others (Krammer 2022).

During the COVID-19 pandemic many organizations have struggled to stay afloat, with six times more companies experiencing disruptions than usual (BCI 2021). In a March 2020 survey, 95% of companies surveyed reported supply chain problems due to the pandemic (ISM 2020). Yet some businesses are doing better than before, even flourishing under the current situation (Sneider and Sternfels 2020). We are motivated by this contrast. In order to understand this phenomenon, we adopt a broad supply chain view, and using that lens analyze the actions of various organizations

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that have been affected differently. In particular, we focus on strategies to balance supply with demand.

If we look from the view of supply chain management, the main theme that places COVID-19 pandemic apart from any other disruptions of the past is that its reach has the potential to impact almost all possible entities in the supply chain (Hald and Coslugeanu 2021; Yu et al. 2021). Even during past disasters only parts of the end-to-end supply chains have been disrupted (Sheffi 2005; Gupta et al. 2016; Talapatra and Uddin 2019). For example, after the 2011 earthquake and tsunami in Japan, although supplier facilities were affected, global logistics infrastructure largely remained intact and customers across the globe did not shy away from purchasing goods manufactured in Japan. During the California dockworkers' strike in 2002, only the logistic hubs were halted temporarily. Even during the recent US-China tariff war in 2019, businesses were thinking to alter only portions of their existing supply networks. The COVID-19 pandemic, however, can potentially affect all entities in the supply chain, including customers (what and how they buy), suppliers, logistics providers, and the organization's own tangible and intangible resources. Such intense challenge of much larger scale has forced us to have a fresh look into supply chain disruption management.

Recently, Sodhi and Tang (2021a) urged researchers and practitioners to rethink how supply chains may need to deal with varying conditions. Depending on varying level of disruption in supply and demand, they argued that the scopes of (1) supply chain management (SCM) would be to deal with regular variations, (2) supply chain risk management (SCRM) would be to handle moderate to large variations, and (3) extreme supply chain management (Extreme SCM) would be to handle challenges of extreme mismatches of demand and supply caused by an event like the COVID-19 pandemic. In order to match these three levels of variations, in a related study Chopra et al. (2021) proposed supply chain risk mitigation strategies using "commons" or sets of resources pooled at three different levels: (1) within an organization, (2) across multiple organizations within an industry, and (3) across multiple industries. In a related work, Sodhi and Tang (2021b) proposed a three-tier approach using inventory, backup capacity, and standby capability to deal with three levels of crises.

Ripple effect or disruption propagation in supply chain (Dolgui et al. 2018) is a prominent research stream worth mentioning here. Ivanov and Dolgui (2021a) placed the works related to ripple effect at three levels: network, process, and control. The network level models consider macro view of structural property of supply chain disruptions and do not include the operational parameters, which are within the scope of process level models. The control level models deal with more granular details including production

planning, routing, and inventory control. Similar multi-level analyses have been carried out earlier. For example, using network theory and complex systems perspectives Peck (2005) developed a conceptual model of a supply chain as an adaptive system, and examined the drivers of supply chain vulnerabilities. The study concluded that the dynamic nature of the issue should be viewed from multiple perspectives and analyzed at four levels: value stream/product or process, asset and infrastructure dependencies, organizations and inter-organizational networks, and social and natural environment.

While the above-mentioned works are very useful, we did not come across any study that focusses on why many organizations faded away due to the major challenges, whereas a number of them dealt with the challenge reasonably, and a handful of them even thrived. While organizations encountered this fading-thriving divide in the face of the pandemic, some of them clearly handled the situation well with varying degrees of success. It is important to analyze and understand the actions taken by these organizations resulting in varying outcomes and potentially explain those actions for managing disruptions from a theoretical lens (Vogus and Sutcliff 2007).

While the diverse body of works in the extant literature provide valuable insights, there is a research gap in theories for explaining the decision process of managing disruptions. Wieland (2021) argues that the COVID-19 pandemic has highlighted the importance of connecting supply chain research with other fields. Flynn et al. (2021) add that this new crisis (referring to the pandemic) requires new approaches and new research questions. The operations management literature is generally prescriptive explaining what tactics can be used to manage disruptions (focusing on what) (Ambulkar et al. 2015). Organizational theories on the other hand, focus on causal relationships (focusing on why) (Craighead et al. 2020). Hence, research focusing on the process of managing disruptions (focusing on how) is scarce (Handfield and Melnyk 1998). This paper addresses this research gap. In particular, the topics in the current literature do not clearly discuss diverse outcomes arising from the same set of externalities faced by the organizations. One may argue that varying levels of capabilities (agility, adaptability, etc.) of the organizations may contribute to diverse outcomes. While that may be true to some extent, organizations will also need to harness their capabilities effectively to recover from disruptions. Something clearly not all can do at the same level. Thus, we argue that the effectiveness to harness the capabilities depends on how well organizations can (1) assess the situation or context, (2) assess their capabilities, and (3) take necessary actions based on these two assessments. We did not come across any work in supply chain literature covering this notion. In order to fill the gap,

Altay and Pal (2022) developed a conceptual framework based on coping theory in psychology with the intention that it would offer a new theoretical lens to understand supply chain disruption management. Their framework leads us to two main research questions:

RQ1: How does coping help organizations in managing supply chain disruptions?

RQ2: How useful is coping in explaining the actions of organizations facing diverse disruption induced challenges?

In this study, we gather evidences and synthesize information to answer these questions, and using a proposed framework, we demonstrate how supply chain coping strategies may explain outcomes of several organizations from different industries during the COVID-19 pandemic. The novelty of our work lies in providing empirical support for a newly adapted theory from a different discipline that explains organizational actions for managing disruptions, and developing a generalized framework for helping practitioners to make strategic decisions in this context.

The remainder of the paper is organized as follows. Section 2 provides a brief review of disruption management and coping literature. Section 3 covers our methodological approach. Section 4 covers implications of different demand trajectories resulting in varying outcomes. Section 5 provides empirical evidences of diverse set of coping strategies adopted by various organizations during the COVID-19 pandemic. Section 6 synthesizes the findings and finally Sect. 7 provides concluding remarks along with future research directions.

2 Literature Review.

1.1 Supply chain disruption management and resilience

Demand and supply disruptions usually have adverse impacts on firm performance (Wagner and Bode 2008). Furthermore, compared to the downstream side the upstream side of the supply chain may see deeper adverse impact (Parast and Subramanian 2021). In order to recover from disruptions, organizations need to use their capabilities effectively. For example, during the recent COVID-19 pandemic, some of the organizations had to deal with unusual demand spikes triggered by panic buying that got worse with unfiltered information diffusion in social media (Zheng et al. 2021). In order to meet demand some organizations had to make changes in their original product or service in a cost-effective way (Chen et al. 2021). Thus, as we argued before, organizations need to (1) evaluate the situation, (2) assess their capabilities, and (3) based on these two appraisals take effective actions to recover from disruptions. There may be more than one way to deal with the situation.

Supply chain disruption management (SCDM), risk management, and resilience have been very active areas of research in the field of operations management. A recent bibliometric study on supply chain disruptions risks looked into 1,310 publications in Web of Science (Xu et al. 2020). Some of the concepts and practical innovations in this stream of research include flexibility, redundancy, risk pooling, capability building, viability, etc., and these topics discuss diverse ways to manage disruptions and attain resilience. For example, Sheffi and Rice (2005) argued for flexibility instead of just adding redundancy and recognized five areas of flexibility including supply, conversion, distribution and customer facing activities, control systems, and corporate culture. Chopra and Sodhi (2014) argued how segmenting and regionalizing the supply chain may reduce its fragility and covered risk reduction strategies that account for trade-off with cost efficiency. Fiskel et al. (2015) made a case for attaining resilience while balancing between capabilities and vulnerabilities. Ivanov and Dolgui (2021b) stressed on importance of viability analysis of intertwined supply networks and ecosystems. Recently, Das et al. (2021) used multi-criteria decision approach to develop a risk resilience framework. A number of detailed empirical works (e.g. Craighead et al. 2007; Blackhurst et al. 2011; Ambulkar et al. 2015; Dubey et al. 2021) have discussed about factors that influence resilience. Some of these factors include cross-functional teams (de Vries et al. 2022) and knowledge preparedness of the firm (Orlando et al. 2022). The interested reader can find excellent systematic reviews on supply chain disruption management in Snyder et al. (2016), Paul et al. (2016) and Ivanov et al. (2017). Yet these studies do not explicitly discuss how organizations may adapt, respond, and even transform in the face of disruption. Furthermore, varying outcomes for organizations facing similar challenges remain unexplored.

A number of empirical studies investigated supply chain disruption management and resilience. Few illustrative examples from recent literature are mentioned here. Dubey et al. (2021) analyzed data from 213 manufacturing firms to show how data analytics capability and organizational flexibility may affect supply chain resilience. Messina et al. (2020) used case studies to have in-depth investigation on how information is gathered, processed, and used during supply chain disruptions. Using data from 250 firms and building on resource-based view (RBV) and relational view, Dubey et al. (2017) conceptualized the implications of supply chain visibility, cooperation, trust, and behavioral uncertainty for supply chain resilience. Altay et al. (2018) used dynamic capability view (DCV) to conceptualize supply chain agility and resilience. Based on the 335 responses gathered, they investigated the impacts on pre- and post-disaster performances. Juan et al. (2021) looked into the

relationships among the five components of supply chain resilience: visibility, velocity, flexibility, robustness, and collaboration. Using data from 113 manufacturing firms, they analyzed the impacts of these five components on the supply chain performance under disruption.

While the above-mentioned works are very useful, we are not aware of any theory that comprehensively explains the process of organizational responses for managing disruptions. The organizational resilience literature (e.g., van der Vegt et al. 2015) points to abundance of valuable case studies on resilience, and suggests “a clear need to use these observations to build more general theories” (p. 974). Sousa and Voss (2008) also argue that operations management research can gain from enhanced usage of methodologies focused toward theory building. Altay and Pal (2022) argue that coping theory can fill these gaps in the current literature, and offers a sound theoretical foundation for explaining actions to manage disruptions.

Pandemics like COVID-19 are infrequent but highly impactful events. Akkermans and Van Wassenhove (2018) call such events supply chain tsunamis. For such extreme disruptions they suggest integrating sense making and decision making, carefully calculating the trade-offs between robustness and flexibility during implementation, and learning from the experiences before (e.g. training) and during the event as effective disruption management strategies. Separately, Blackhurst et al. (2005) identify three focus areas in managing disruptions: discovery, recovery, and supply chain redesign. These studies probably come closest to what we propose in this paper as coping theory. They suggest management strategies for dealing with disruptions but do not explain how managers should be analyzing, selecting, and implementing these strategies. In the following section, we explain our attempt to do so based on a well-established theory that Altay and Pal (2022) adapted from psychology.

1.2 Coping theory

We borrow coping theory from psychology to explain disruption management in supply chains. Buffa (1980) and later Ketchen and Hult (2007) urged researchers in operations and supply chain management to go beyond traditional subject areas. Taylor and Taylor (2009) and Halldórsson et al. (2015) also have encouraged researchers to use alternative theories and methods to explore new phenomena in operations and supply chain management. Such “borrowing” of theories from other disciplines is not new in operations and supply chain management and there are advantages of doing that (Defee et al. 2010; Halldórsson et al. 2015; Gunasekaran et al. 2018). Coping theory helps to revise SCDM knowledge with an alternative, not previously applied, frame of reference in this domain (MacInnis 2011).

In psychology, the unit of analysis is the individual. Thus, coping theory, which focuses on how an individual copes with stressful situations needs to be adapted to an organization’s behavior in the context of disruptions. The works investigating the influence of psychological theories and cognitive perspectives on organizational behavior started in 1960s (Clegg et al. 1999). While adapting concepts from cognitive theories, organizations have been treated as enacting bodies (Pfeffer 1982) and parallels have been drawn between concepts and strategies (Weick 1979; Altay and Pal 2022) argue that similar argument can be made for coping theory.

In psychology, coping refers to a person’s response to stressful events to prevent, avoid, or control emotional suffering (Pearlin and Schooler 1978; Folkman and Lazarus 1980) define the process of coping as ongoing cognitive and behavioral efforts to master, tolerate, or reduce stressful events. Different stressful situations may require diverse set of coping strategies (Mattlin et al. 1990). This somewhat resembles contingency theory in management. Accordingly, Lazarus (1993) argues that “coping changes over time and in accordance with the situational contexts in which it occurs” (p.235). Thus, coping strategies are context specific and dynamic. This means, coping is about adaptation.

In the business world, particularly, in the field of service operations management the idea of coping is used to satisfy demand with inadequate capacity as contingency under stress (Armistead and Clark 1994; Johnston and Pongatichat 2008). While coping is initially introduced as a capacity management approach in service operations, the basic notion of dealing with stress may be extended to other aspects of managing supply chain disruptions. Coping may not be the best possible way to match supply with demand under ideal conditions, but it works well to provide much needed respite and reprieve under trying circumstances. In coping, an organization first analyses the external (social, political, technological factors and competitors) and internal (organizational culture, structure and leadership) environment. This includes identification of risks and opportunities, risk calculation and mitigation. The nature of the disruption itself plays a role in the decision making process. Next, the organization goes through a sense-making process (also called the primary appraisal) during which potential alternatives of dealing with the disruption are identified. In the secondary appraisal stage, the organization evaluates the resources available to it and its capabilities that would match with the needs of the potential strategies identified in the primary appraisal. Based on the results of primary and secondary appraisals the organization develops a coping strategy. The outcomes of the selected strategy could be short or long term depending on the internal and external factors. These factors and the available resources and capabilities change in time and

hence a coping strategy which proved to be successful in one scenario may not work in another similar scenario.

2 Methodology

We pursue an exploratory research with a primary objective of finding evidences on how supply chain coping strategies may influence outcomes of different organizations across industries during the COVID-19 pandemic. We resort to secondary sources of information for two main reasons: (1) we intend to obtain information on relatively higher number of organizations which may not be possible via primary data collection initiatives through case studies; and (2) practical consideration of organizations giving much higher priority of devoting resources to deal with the challenges in the middle of the pandemic rather than talking with the researchers. In near future as things come back to normalcy, we intend to conduct in-depth case studies. For the time being, we had to resort to analysis of information from secondary sources. Even if secondary data analysis has limitations, it has been accepted as a well-established methodology for exploratory research (Ellram 1996; Tangpong 2011). A number of articles that used / covered similar methodology (e.g., Harris 2001; Rabinovich and Cheon 2011; Ellram and Tate 2016; Pal and Altay 2019; Lindgren et al. 2020) have been published in reputable journals. More details on desk research and content analysis of secondary data can be found in Robson and McCarten (2016).

Although formal case studies were not conducted, broad principles of theory building through case study research (Eisenhardt 1989; Yin 2009) were utilized. We gathered information from multiple organizations, and looked closely at existing literature to identify and understand the coping strategies. The main steps of our research methodology include (1) research design, (2) preparation for data collection, (3) collecting the evidence, and (4) analyzing the evidence. Next, we briefly discuss these steps and present the information using a flow diagram in Fig. 1.

2.1 Research Design

The important starting point was to review the extant literature closely and identify the gap. We reviewed scholarly journals, practitioners' magazines, government and industry reports / white papers that covered SCDM, risk management, and resilience. This helped us identify the need for a theoretical lens to explain actions taken by organizations in the face of supply chain disruptions. After going through various existing theories, we zeroed into coping theory (Altay and Pal 2022). Subsequently, we discussed suitability of using secondary information obtained from

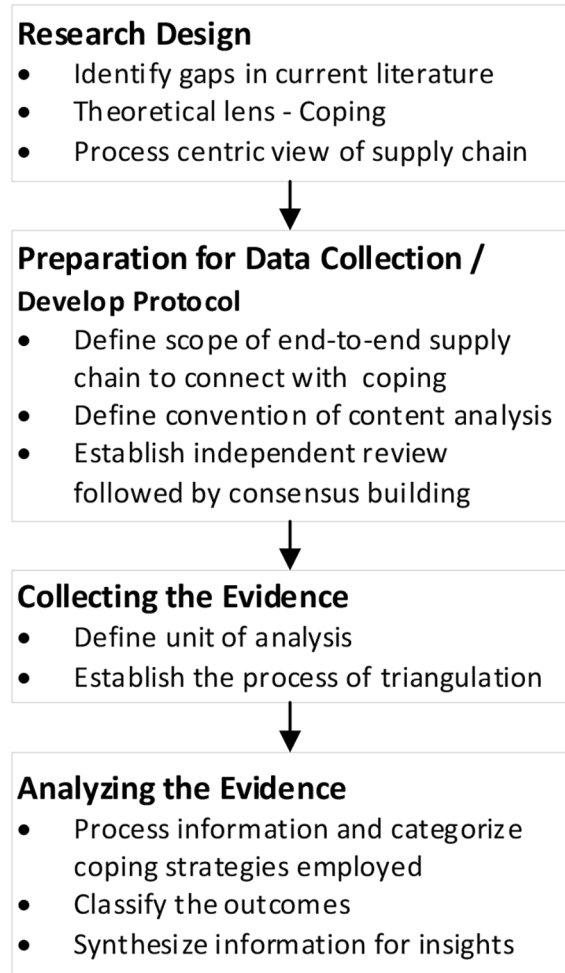


Fig. 1 Flow diagram of major steps in the research methodology used

news articles / published reports that would provide evidences on how supply chain coping strategies may have influenced outcomes of different organizations across industries during the COVID-19 pandemic. In order to analyze information rigorously, it was important to understand organizations' business operations, and how these organizations adapted their internal setup and/or modified interactions with upstream/downstream partners in the supply chain. For this purpose, we decided to take a process-centric view of supply chain and to analyze information by taking this view into consideration.

2.2 Preparation for Data Collection

We approached data collection with an open mind so that contradictory evidences (if any) were not overlooked. First, we planned the data collection strategy and developed the protocol by ensuring author consensus on the elements of supply chain that we would try to relate with coping strategies.

This included end-to-end supply chain operations capturing internal, downstream, and upstream specific actions covering product / service, process, capacity, partners, customers, demand, distribution channel, price, and promotion. While gathering information we followed general conventions of content analysis (Weber 1990): the authors would independently read each article / report, identify elements of supply chain connected with coping strategies adopted by the organization covered, and record it separately. Later notes would be shared and discussed to build consensus. If no consensus was to be reached, the authors had agreed to eliminate that particular article / report from the analysis. Thankfully, in this study, no such cases arose and the authors were comfortable with the overall reliability of the information collected. Such sound protocol development enabled by a pre-determined systematic process played central role in our qualitative analysis (Gibbs 2007).

We searched for news and media articles using Nexis Uni which is the successor of the Lexis Nexis database. Academic article searches were conducted using Google Scholar and Scopus. And, industry reports and white papers were found using Google searches. We searched for the keywords COVID-19, pandemic, disrupt*, coping, and resilience. The search took place in April/May 2021 for the interval between January 2020 and May 2021. While we looked for information through online searches and research databases, we ensured that they came from credible verifiable sources. Due to current nature of the content most of the information sources were news articles / media reports.

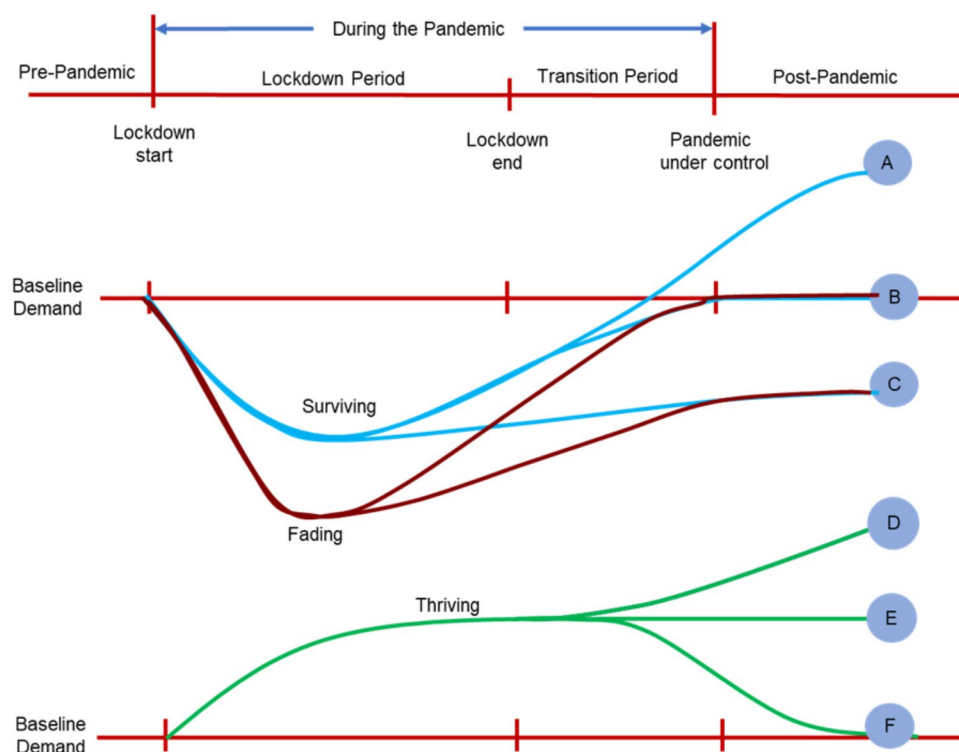
2.3 Collecting the evidence

As the media coverage was primarily focusing on organizations, we kept our unit of analysis as the organization. In limited number of occasions, the same information was published in more than one outlet and we used these multiple sources to validate the information. In order to further triangulate the information gathered, we went to the websites of these organizations when available. However, overall scope of triangulation was limited, as we had to deal with scarce information.

2.4 Analyzing the evidence

The information gathered is analyzed systematically. Using a pre-defined set of supply chain elements we categorize the information collected, and present the evidence of coping strategies undertaken by various organizations. We also use potential demand trajectories in pre, during, and post pandemic periods to classify the outcomes. Such systematic categorization of evidence collected is useful for unbiased treatment of all pieces of information leading to alternative interpretations and ultimately synthesizing those pieces to draw sound conclusion (Miles and Huberman 1994; Gibbs 2007).

Fig. 2 Organizations' potential demand trajectories



3 Implications of varying demand trajectories

In order to have a better understanding of an organization's situation, one can map it with probable demand trajectories (pre, during, and post pandemic). Depending on its mapping to demand trajectories before and during the pandemic, an organization may be placed into one of the following three paths: fading, surviving, and thriving (see Fig. 2). The baseline demand in this figure refers to the average aggregate demand a company was experiencing before the pandemic. This figure is a stylized model, an abstract representation of what we sense is happening in the business world. Although the pandemic's progression does not have clear-cut period start- and end-points as shown in Fig. 2, we assumed that such transition points exist. Subsequently, we shared the figure with three chief procurement officers (CPOs) from different sectors to conduct a sanity check. All three CPOs mentioned that these demand trajectories made sense to them.

How the trajectories in Fig. 2 will actually shape up in the post-pandemic era (i.e. after the pandemic is under control globally) is yet to be seen. Our unit of analysis is the company rather than a sector. It is possible that multiple organizations in the same sector face very similar challenges, but may have different outcomes at the end of the pandemic. A good example is air travel. Due to the lockdown, airlines lost their passengers. However, some of the airlines are able to cope with this by moving cargo in passenger planes and reducing cash burn to some extent. Others that are unable to deploy effective coping strategies follow a fading trajectory, and have been more reliant on external interventions, such as government assistance.

Companies that are negatively affected from COVID-19 may follow two distinctively different trajectories. Companies that were able to deploy coping strategies experience less of a dip in their demand. On the other hand, companies that are not able to cope in any way with the disappearance of their demand follow the fading trajectory. In contrast, some companies are thriving due to hike in demand. These six possible outcomes are listed as A, B, C, D, E, and F in Fig. 2. We discuss below how companies may follow different demand trajectories leading to these outcomes.

Outcome A represents companies that were able to identify new customers/markets for their products/services and their old customers are expected to return after the pandemic. One such example is XpresSpa Group, a leading retailer of spa services at airports. When the pandemic drastically reduced the numbers of air travelers, XpresSpa created XpresTest a wholly owned subsidiary to add COVID-19 testing and screening services to their portfolio, and partnered with major airports to deliver these services to airport

employees (i.e. coping strategy: new product with new partner to new customer). Therefore, once leisure travelers are back to airports the company will have a bigger portfolio of services to offer their customers. Similarly Steri-Clean, a nationwide biohazard cleanup service, initially lost most of their hoarding cleanup jobs due to the lockdown. The company immediately pivoted their services to disinfecting offices for businesses (i.e. coping strategy: same distribution channel, new customer). Their workplace disinfection business is booming, and when their residential customers return, the company will be in a much better position than they were before the pandemic.

Outcome B represents companies that were separated from their customers and were unable to find new customers (i.e. fading). Typical examples include airlines, hotels, and gyms. Companies who were able to cope are the ones that were able to change their offering and cater to a new type of customer although temporary. As we mentioned above some airlines switched to moving cargo in passenger planes to cope with the situation (i.e. same distribution channel, new customer). However, others were not able to do that and watched their revenue disappear (i.e. fading). These airlines on the fading trajectory would not survive without external assistance. Similarly, some hotels signed contracts with local governments to operate as quarantine locations, as a coping strategy (also same distribution channel, new customer) but most hotels outside of big cities did not have this option. Finally, gyms lost their customers and closed their doors during the lockdown. Eventually, people will start traveling and going to gyms again. Until then the fading companies need to survive on their savings and/or government subsidies. Another example, outside of the ones we just mentioned is McDonald's. When McDonald's customers were not able to come to the restaurants the company decided to go to them. This is a coping strategy where the company employs new distribution channels to reach their old customers. After the lockdown, the company expects their clientele to return to the restaurants.

Outcome C represents companies that may not fully recover from the pandemic. For example, the rental car company Hertz filed for bankruptcy to cope, but is losing many of its franchisees and thus may not bounce back fully. This trajectory also includes those companies, which probably have the means to survive the pandemic but cannot adjust their business model to the "new normal" whatever it may be. If history repeats itself, we will see bankruptcies similar to the beginning of the e-commerce era when brick and mortar retailers were not able to re-structure their organizations and adapt their business models to compete with e-retailers. Examples include Service Merchandise and Circuit City. Recently, J.C. Penney filed for bankruptcy to cope with the pandemic but it will take more than

debt restructuring to survive the new normal. Most likely, COVID-19 will throw a similar challenge to gyms. Gyms that cater more to competitive body builders such as Gold's Gym follow a fading trajectory and may have a harder time to come back because their clientele need access to heavy weights (The Dallas Morning News 2020). In contrast, gyms that can convert their services to e-fitness models such as home workout apps or remote personal training sessions are likely to be successful.

Outcome D represents companies that take advantage of the pandemic to establish a sustainable business model for the post-pandemic era. One example is the Singapore-based cancer diagnostics company Biolidics. The company immediately focused on developing a virus test kit for COVID-19 and received permission to market it in the European Union. Our experience with SARS, MERS, and other epidemics in the last decade shows that the exposure and risks to epidemiological events have significantly increased. This means a continuously increasing demand and need for precision in diagnostic tools. Biolidics, despite being small compared to pharma giants like Roche, positioned itself very well in this sphere by taking advantage of their diagnostic capabilities.

Outcome E represents companies with services that are essential during the lockdown. A good example is subscription-based services. For example, Zoom, Slack, and Netflix increased their business as people started working from home (coping strategy: same distribution channel, new customers). Instacart and Amazon Fresh also took advantage of this opportunity as online grocery sales peaked (same distribution channel, new customers). Companies that combine food and subscriptions, for example, meal-kits like Blue Apron also saw a big increase in their revenue. However, these companies will have to be able to hold on to their newly acquired clientele even after the pandemic is over. Customers who recognize the value in convenience will be looking for a reason to stay with the service. For others, excellent customer service and high-touch marketing may be the solution for these subscription services.

Outcome F represents companies that cater to discretionary buyers. These include computer gaming powerhouses, such as Activision Blizzard (Call of Duty), Epic Games (Fortnite), and Nintendo (Super Mario). All three of these companies saw a significant increase in their business during the lockdown. However, once we start spending more time outside of our homes the sales for these companies should go down to their pre-pandemic levels.

In order to understand an organization's response under stress, it is important to analyze the underlying coping strategies. Below we describe coping strategies for service as well as manufacturing organizations with illustrative examples of how they dealt with fallouts from the COVID-19 pandemic.

4 Evidences of Diverse Set of coping strategies

Through our research, we see that organizations found different ways to deal with the challenges posed by the pandemic. We take high-level abstraction of their actions using a generic supply chain view as presented in Fig. 3. A focal firm's actions may trigger various combinations of changes including modifications in its internal operations, downstream or upstream side of its supply chain, and/or across the chain. We discuss diverse set of coping strategies adopted by different organizations. We organize the list based on at what stage or echelon of the supply chain the coping strategies are applied.

4.1 Coping in downstream side of Supply chain

One coping strategy is to use the same distribution channel to serve new customers (Fig. 4). When demand for passenger flights disappeared Virgin Atlantic and Lufthansa switched to carrying cargo such as ventilators, PPEs, and masks in their passenger planes (New York Times 2020). Normally, airlines carry some cargo in the belly of the passenger aircraft but the increased demand for cargo shipments combined with the reduced demand for passenger travel led those airlines to make changes in their operations. In the United States, the big three airlines also started

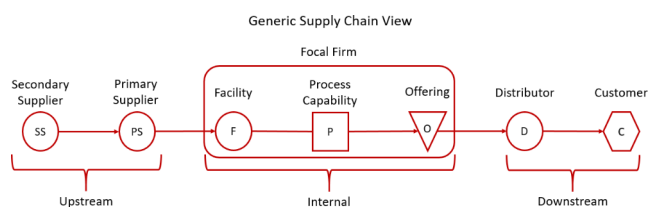


Fig. 3 Entities of a generic supply chain

Same distribution channel, New customer

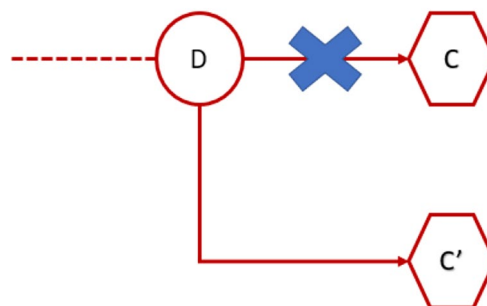


Fig. 4 Schematic diagram of using same distribution channel to serve new customers

carrying cargo in passenger planes in late March 2020 once they received permissions from the Federal Aviation Administration.

Another coping strategy is to use new distribution channel(s) to serve new customers (Fig. 5). Due to social distancing, many breweries and wineries lost their sales from taprooms and facility tours, respectively. Keg sales also suffered significantly, as restaurants were closed. Breweries that had canning and bottling lines could sell to retailers, but those that did not have that option had to search for newer customers to survive. Once such brewery is PIVO in Calmar, Iowa. The owners started delivering beer to two-hundred miles away Des Moines market in a family van (Des Moines Register 2020).

Another possible coping strategy is to use new distribution channel(s) to serve the existing customers (Fig. 6). Nike closed more than 5,000 of its roughly 7,000 directly owned and partner-operated stores during the lockdown in China and focused more on online business (Bain 2020). During the three-month period ending on February 29 in 2020, Nike’s business in China fell by 5% but there was more than 30% growth in its online sales compared to the same period last year.

New distribution channel, New customer

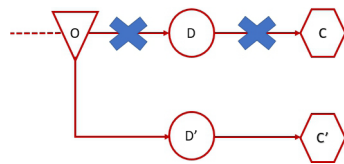


Fig. 5 Schematic diagram of using new distribution channel to serve new customers

New distribution channel, Same customer



Fig. 6 Schematic diagram of using new distribution channel to serve same customers

Fig. 8 Schematic diagram for reducing number of offerings to the customers

Filter/restrict access to customers

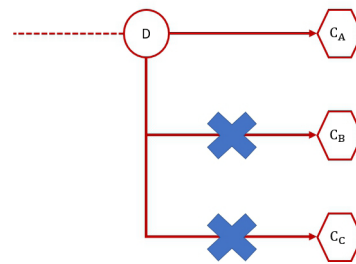


Fig. 7 Schematic diagram of restricting access for the customers

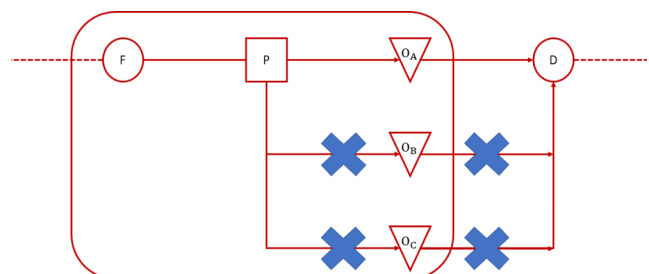
Restricting access for the customers is also a possibility (Fig. 7). Best Buy CEO, Corie Barry, explained her decision to close stores temporarily and then allowing customers back to stores by appointment only, citing heightened safety and enhanced customer experience (Repko 2020). Besides these reasons, it is not difficult to hypothesize this move is focused towards serious potential buyers who would take time to make appointments, sales associates would be better prepared to sell big-ticket items, and ultimately Best Buys’ resources will be utilized more efficiently.

In order to facilitate better access to certain customer segments, particularly who are more vulnerable during the pandemic, businesses have taken precautionary steps. Many retailers, including Walmart (Tran 2020), have designated restricted hours of curbside pickup for elderly, first responders, customers with disabilities, and customers in higher risk category as identified by the Center for Disease Conctrol. Besides social and ethical aspects, this is conducive for continuing business with these sets of customers.

4.2 Coping in Internal Operations and downstream side of Supply Chain

Reduction in number of offerings is a known coping strategy in the service sector (Fig. 8). During the pandemic, retailers carried limited number of brands, even kept only the private labels. For example, during the peak of shortage, many Costco stores did not have Charmin toilet papers; instead, they carried only the Kirkland brand. Wegmans supermarkets sold only private label dishwashing liquid for a while. It is also reported that there have been increased sales of

Reduce number of offerings



certain private brand / store brand products in grocery stores (Atmar et al. 2020). Many customers tried store brands for the first time and reportedly will buy again. This potential switch would not have happened readily if there were no limited offerings in stores. McDonald’s reduced its menu for drive-through and curbside pickup. Many hospitals decided to cancel / postpone elective surgeries. Such classic reduction in offerings (Frei 2006) is common in service operations and even can be quite beneficial to keep focus on priorities during an emergency.

As presented in Fig. 9, some organizations changed setup to offer new products / services (Betti and Heinzmann 2020). Luxury brands like LVMH changed production line setup to switch from making perfume to hand sanitizer. Similarly, industrial companies are making hygienic masks, distilleries and breweries are creating disinfecting alcohol, and hotels are serving as quarantine centers.

Even making significant changes to offer new product to new set of customers with assistance of new partners can be a possible coping strategy (Fig. 10). Ford partnered with GE Healthcare to repurpose some of its equipment and redirect workforce to make ventilators (National Public Radio 2020). General Motors and many other manufacturing organizations also have made similar moves that would help them have better use of under-utilized resources during low demand period due to the pandemic.

4.3 Coping in Internal Operations

In order to cope with the new situation, many organizations had to change internal processes and/or facility layout

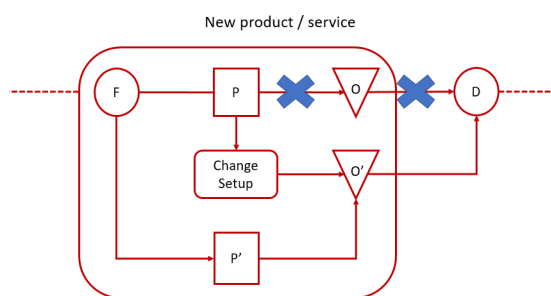


Fig. 9 Schematic diagram for changing setup to offer new product / service

Fig. 11 Schematic diagram for using alternate facility / process

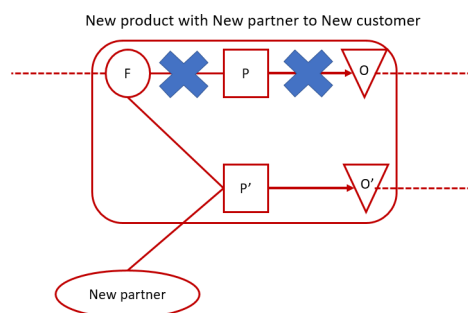


Fig. 10 Schematic diagram for offering new product with new partner to new customer

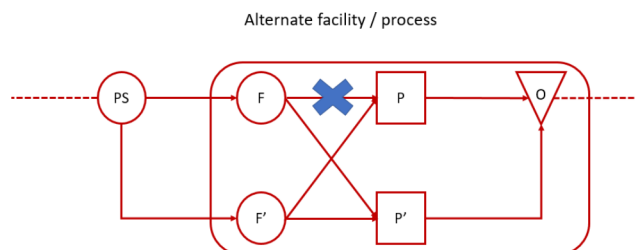
significantly (Fig. 11). A classic example is switching of the education sector from face-to-face classroom-based delivery mode to distant learning. Organizations providing essential services during lockdown and the ones opening after lockdown had to change facility setup to maintain distancing according to Occupational Safety and Health Administration guidelines (OSHA 2020). The State of New Hampshire has changed the process for people to register by mail to vote in the fall 2020 election (Rogers 2020). Other states took similar steps.

4.4 Coping in Upstream Side of Supply Chain

Exploring new suppliers is a distinct possibility (Fig. 12). Due to acute shortage of equipment and supplies, healthcare providers had to work with many new vendors/suppliers they had not dealt before. Northwell Health, New York’s largest healthcare provider, could procure and maintain adequate stockpile of PPE and supplies by working with many non-traditional suppliers joined together by IBM’s technology solution, named Rapid Supplier Connect (IBM 2020). Global Healthcare Exchange also provided similar services to the healthcare community (GHX 2020).

4.5 Coping across the Supply Chain

Some coping strategies may be applicable at any echelon in the supply chain. Alternative transportation modes and routes had to be explored in trying times. Such alternate distribution route / logistics provider may be used anywhere in the supply chain (Fig. 13). As shortage of supply from China continued during lockdown, Averitt and its partners



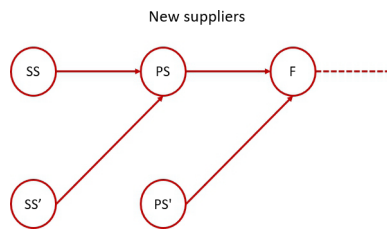


Fig. 12 Schematic diagram for using new suppliers

offered an alternative solution to assist with the backlog (Averitt Express 2020). As air space in China was critically tight for direct air cargo, Averitt was moving cargo by vessel from Qingdao in China to Incheon in Korea and then sending to Chicago and Atlanta by air. This avoided long waits at Shanghai airport.

In order to save money, portion of unused transportation capacity on certain routes maintained by logistics providers for some other goods may be tapped. Timex Industrial Investment, the company that manages the rail route between Yiwu in China and Madrid in Spain, and runs freight trains for moving electronics, automobile components, and other goods from China, was transporting medical masks and protective suites to Spain utilizing the available spaces in the same trains (Shepard 2020).

Under difficult situations, sometimes it may be needed to relax quality standards and/or downgrade service quality to some extent (Fig. 14). The Food and Drug Administration eased some of the regulations for new entrants to start making ventilators rapidly (Bell 2020). Without easing, it would have taken months if not years to start production. YouTube reduced streaming quality to reduce network load (Filey 2020). In the European Union, Netflix was asked to consume less bandwidth and they agreed to stream video in standard definition by cutting its streaming rate by 25% for 30 days starting in March 2020 (Archer 2020). Google considered adjusting the quality of video captured by Nest security cameras to ease strain on broadband networks (Peters 2020). If the camera quality and bandwidth settings were higher than the default, Google decided to roll back those settings to default.

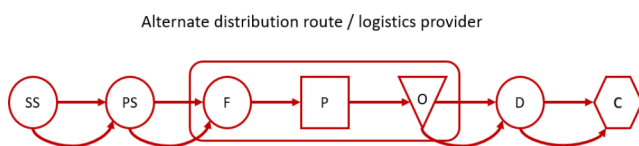


Fig. 13 Schematic diagram for using alternate route / logistics provider

5 Synthesis of findings

5.1 Underlying themes in coping strategies

Based on the coping strategies discussed above, we identify the three main themes as follows.

5.1.1 Fit of product / service Offering with Shift in demand

Because of the pandemic there were shifts in demand patterns. While some essential services experienced increased demand, some discretionary items saw their demand reduced. Additionally, these changes happened in short-term, medium-term, and long-term depending on which items one was considering. For example, at least in the short term we saw an increase in demand for groceries, telemedicine, and delivery services, but a decline in demand for fashion apparel, air travel, and hotels.

5.1.2 Reaching the customers (Online and Brick-and-mortar distribution channels)

In the recent past before the pandemic, we have noticed increased physical presence of Amazon and store closures by Walmart. It is possible that organizations will need to adjust their individual balance in their channel mix during the pandemic and revisit it again in post-pandemic era. While online channel continues to play a critical role due to social distancing during the pandemic, brick-and-mortar presence may still provide a complementary / supporting role. A good example for this is online food delivery by Whole Foods Markets.

5.1.3 Managing disruptions in Operations (Internal and External)

An organization’s operations may be disrupted due to internal (e.g. personnel not being able to report to work, temporary facility closure due to safety reasons, etc.) and external reasons (e.g. supplier is low on stock, supplier ran out of business, supply is reaching late or in smaller quantity than expected, etc.). It is critical to deal with such disruptions effectively.

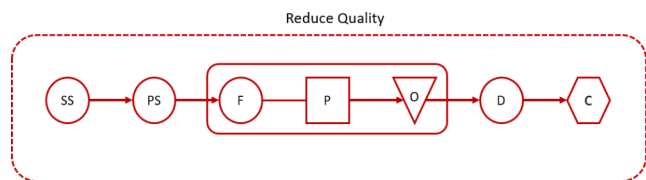


Fig. 14 Schematic diagram for offering product / service with reduced quality

5.2 Basic questions that Organizations need to answer

Based on the above-mentioned themes and evidences gathered and discussed earlier, it seems logical that organizations need to answer some of the following questions covering internal, downstream, and upstream sides of their supply chain and figure out necessary coping strategies. Although we do not have clear evidence, it is plausible that depending on the problem context a particular set of capabilities and coping strategies, or a subset of them, may be more effective than others.

Product / service What do we sell? Nature of product/service may or may not be well-received in a prolonged crisis. Are our offerings being affected by the shift in demand patterns? If so, how much and for how long? Do we need to change our offerings? If so, pivoting to new offerings using existing resources and capabilities may be a viable option.

Process How do we make / deliver the product / service? Do we need to tweak our internal setup? Do we need to adjust resource / capability at upstream, internal, or downstream

levels? If so, structural change in operations would be needed.

Capacity What options are available to adjust capacity in order to match demand? Explore viable resource adjustment alternatives.

Partners Do we need to find a different supplier? Is the current logistics provider still offering the best solution? If affirmative, supply chain network may be altered.

Customers Who do we sell to? Do we need to find alternate customers? If so, exploring new markets or market segments would be critical.

Demand Can we manage demand by smoothing peaks and valleys? Can we influence customers to buy a substitute product by offering limited choices? Is pushing complementary offerings an option to increase revenue? Can we get advanced intimation about demand and prepare accordingly? Analytics capability would help.

Distribution Channel How do we reach customers (Online vs. Brick-and-mortar vs. Omni-channel)? Do we need to modify the distribution channel? If affirmative, newer channels need to be explored.

Price How elastic are prices in our sector? How would our customers perceive price increases during a crisis? Marketing analytics would help.

Promotion Can we use promotion and/or liquidation sales to reduce inventory and generate cash? Financial analysis would justify the actions.

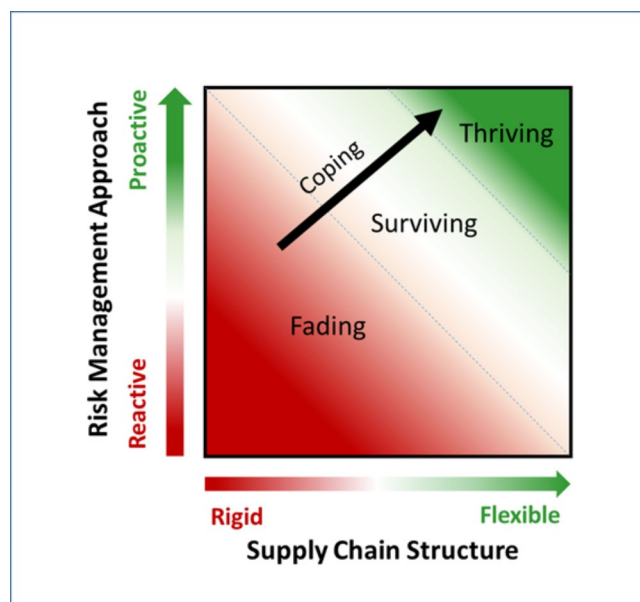


Fig. 15 Coping's role in bridging the fading-thriving divide

5.3 Use coping to Bridge the Fading-Thriving divide

The conceptual framework proposed by Altay and Pal (2022) based on coping theory in psychology is poised to provide a comprehensive lens in understanding actions of organizations in the face of disruptions. It covers all major elements of disruption management including internal and external factors, situational assessment, resources, capabilities, adaptive response, short-term considerations, and long-term orientation. Although not exhaustive, in this paper we presented a number of evidences that seem to provide support to the following propositions discussed by Altay and Pal (2022):

- 1) Coping enables adaptive response and can explain differential outcomes under similar conditions.

- 2) Effective coping may increase resilience of organization and viability of supply chain.

However, further detailed investigation will be required to validate these propositions. Based on Altay and Pal's (2022) conceptual framework and evidences presented in this paper we argue that effective coping strategies may help organizations transition from fading to surviving mode, if not bring them to thriving level. Hence, we propose the following framework that presents coping as a bridge from fading to thriving (Fig. 15).

The risk management approach of an organization as well as its overarching supply chain structures surrounding its product / service offerings, process capabilities, supply network, channels, etc. may largely dictate the trajectory it is likely to follow in a crisis. Even if the supply chain structure does not offer much flexibility, organizations may be able to avoid fading and stay in a coping trajectory to survive with proactive risk management. On the other hand, firms with flexible supply chains are naturally poised to weather the storm. Proactive risk management may enable them further to elevate from coping to thriving trajectory. Thus, coping can bridge the fading-thriving divide.

6 Conclusions

6.1 Paradigm shift

While the idea of coping pivots on the notion of surviving crisis, organizations will need to learn to manage crises as interconnected processes with a long-term focus rather than reacting to an incident with short-term focus. Organizations will have to develop capabilities to be resilient and responsive in the long-term (Altay and Pal 2014; Dubey et al. 2018). In fact, more and more coping strategies may evolve with those capabilities, and it will open up more choices to avail (if needed) and help responding to a crisis with lesser pain. After the pandemic is over, we are likely to enter a "new normal" era where certain suppliers / partners may have disappeared forever, customers may have different expectations, and even the business model may change in some cases. There will be significant changes in certain aspects of how businesses operate. There will be possible changes in supply chain network design and processes, more focus on flexibility and adaptable redundancy (Dolgui and Ivanov 2021), possible changes in financial structure with inclination to deeper reserves for contingency, and a closer look into risk management with more rigorous estimates of cost and benefit of resilience. More people will be availing telecommuting, telemedicine, and online shopping. Commercial organizations may possibly learn from

mitigation, preparedness, response, and recovery, stages in life cycle of disaster management (Altay and Green 2006). This pandemic is providing first-hand understanding of the inter-connected nature of the world and will hopefully make people and businesses more aware and responsible.

6.2 Implications of this research

This research has both theoretical and practical implications.

6.2.1 Theoretical implications

Altay and Pal (2022) adapted coping theory from psychology and introduced to supply chain disruption management (SCDM). Their conceptual framework offers a new theoretical lens to explain how organizations manage disruptions in their supply chain. This work provides empirical support to that theoretical framework. The operational understanding of SCDM through the lens of coping is substantiated through multiple examples presented in this work.

The organizational aspect of disruption management is mostly overlooked in supply chain literature. Apart from traditional system level considerations such as buffer stock, alternate suppliers, capacity cushion, etc., evaluation of short-term and long-term outcomes while accounting for the gaps between organization's assessment and actual situation as well as the gaps between organization's intent and capability is critical. In particular, a firm's position in the supply chain (e.g., upstream vs. downstream), number of alternate suppliers, competition, and availability of distribution channels are important considerations. This study sheds some lights on some of these organizational aspects of managing disruptions and complements Ivanov's (2020) viable supply chain (VSC) concept that integrates agility, resilience, and sustainability, and argues in favor adaptable supply chain structures and mechanism for transitioning to varied supply chain designs.

How organizations may respond, adapt, and even transform after assessment of disruptions can be explained well by coping theory. Dynamic interactions of people and nature in complex systems are not covered explicitly by any organizational theories. But the process-centric view of coping theory explains the internal dynamics of enabling the adaptation process (Altay and Pal 2022). This work provides empirical evidence of such adaptive response, which is key for managing supply chain disruptions.

6.2.2 Practical implications

We take a process centric view of supply chain and using evidences from practice show how different coping mechanisms may help overcoming disruption-induced challenges

at different entities of the supply chain. This will help decision makers to have a better understanding of how to manage disruptions. Many of these decision makers including managers and executives have direct reports, and working with employees at time of distress is an important skill to have. Instead of focusing only on the disruptive event and/or their competitors' responses, they need to have a broader view of the intertwined nature of their supply chains, and deeper understanding of how their organization's coping strategy depends on the organizational capabilities (to assess the situation), resources, and vulnerabilities as well as external conditions. This research will help the practitioners from these perspectives.

We also discuss coping's overarching role in managing disruptions and argue that effective coping strategies may help organizations transition from fading to surviving mode, if not bring them to thriving level. The framework suggests that an organization may select effective coping strategies depending on its risk management approach (reactive vs. proactive) and supply chain structures (rigid vs. flexible). Broader understanding of this framework will help executives make strategic decisions in SCDM. The ISO 22301:2019 (security and resilience) and ISO 31,000 (risk management) standards should be a good start for supply chain managers thinking about implementing disruption management practices in their firms.

6.3 Limitations and Future Research

While the evidences we gathered are promising, we are limited by the information we have. To expand the scope of this stream of research more detailed information may be collected and analyzed. We are yet to figure out which coping strategies may be more effective for which organizations under which circumstances. In-depth case studies are needed to explore these types of research questions. Looking at the coping strategies deployed in previous disruptions and comparing them with strategies used with the COVID-19 pandemic will provide more discussion that is comprehensive. Also, the impact of repeated waves of lockdowns due to multi-phase disruptions caused by variants of the corona virus was not covered in this paper. We believe this will be a very interesting area of future research.

In this study, our unit of analysis is the organization. We do not have information on how supply chain partners of that organization responded to the same crisis. For example, we know that Costco limited number of brands it carried during the toilet paper shortage crisis. It would also be useful to know how toilet paper manufacturers made changeovers to respond to the demand shift from the commercial market to the household market. Analyzing the responses of all relevant supply chain partners to the same stimulus /

situation would bring supply chain wide view and add richness to our findings.

It is important to have a holistic view of managing this crisis. Although we primarily focus on the supply chain view in this article, it is important to think about other factors as well. Internally, organizations can also resort to cost cutting, freezing capital spending, furloughs and layoffs, and debt restructuring. Externally, coordination with governments for assistance, interventions, and lockdown decisions, can alleviate some of the uncertainty. Furthermore, managers need to understand consumer behavior during a crisis and possible strategies to influence that behavior. For example, grocery stores restricting amount of sales of certain items to a single customer to avoid potential hoarding was effective in managing supply shortfalls. Internal to the organization, its culture (e.g. situational awareness and local decision-making capability), leadership style (e.g. adaptive leadership as discussed in Heifetz et al. 2009), and adoption of appropriate technology and innovation (Bogers et al. 2019) (e.g. automated analytics for sense making from supply chain data streams) will define how an organization will adapt to the new normal. One thing is for sure: organizations need to learn lessons from this pandemic. Lord Buddha said, "There are three solutions to every problem: accept it, change it, or leave it. If you can't accept it, change it. If you can can't change it, leave it." Hope majority of the organizations will take the "change it" option.

Declarations

The authors have no relevant financial or non-financial interests to disclose. The authors have no competing interests to declare that are relevant to the content of this article. All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript. The authors have no financial or proprietary interests in any material discussed in this article.

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