Improving internal management capabilities to increase supply chain resilience and financial performance – a dynamic capabilities perspective

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Abstract: The disruptions of various supply chains due to the outbreak of COVID-19 have been incurring researchers and practitioners to re-evaluating the benefits and risks involved in global sourcing and find ways to increase supply chain resilience. Building on the dynamic capabilities perspective, this project proposes a conceptual model to identify the underlying mechanisms and factors that improve the resilience of supply chains and increase the company's performance accordingly. The theoretical model is empirically tested by analysing a dataset including 276 companies in China. The results in this study contribute to the literature by theoretically proposing and empirically testing a new theoretical model in identifying the intra-organisational antecedents of management capabilities and analyse the outcomes of supply chain resilience in improving performance. It also contributes to business practitioners by providing useful information and guidelines to enhance supply chain resilience.

Keywords: supply chain resilience; operation flexibility; operation robustness; resource redundancy; information management.

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1 Introduction

The outbreak of COVID-19 has been influencing the manufacturers in China adversely, which led to a big supply disruption globally in various consumer and industrial products, such as electronics, automobiles, as well as surgical gowns and masks, etc. This disruption makes us rethink the model of globalisation and global sourcing.

Over the past several decades, the increasing number of tradable products, low transportation cost and trade barriers have encouraged more and more companies to turn to global sourcing in order to take advantage of the cheaper labour, energy, raw materials and many others in foreign countries. Moreover, the growing need for specialisation due to the increased sophistication of production processes as well as various components has been driving companies to reply on subcontracting to meet their changing demands with flexible capacity. The ultimate results of these two factors lead to 'deeper tiering of supply chains whereby suppliers draw upon their suppliers who in turn draw on their networks of suppliers in multistage production networks' (Shih, 2020). Supply chains with a large number of tiers of suppliers impose great challenges on companies in managing all their suppliers effectively. Generally, the uncertainties and risks can be mitigated with multiple sourcing channels. Unfortunately, the wide application of the just-in-time (JIT) concept and supplier integration make companies rely on very few suppliers to reduce sourcing costs. Companies tend to enhance the efficiency of their supply chains by using single sourcing, reducing inventories (Hendricks and Singhal 2005; Tomlin, 2006), which make supply chains becoming vulnerable to disruption (Christopher and Lee, 2004).

COVID-19 exposed all the risks and uncertainties associated with deeply tiering supply chains and highly interdependent globalisation that had been largely ignored by companies chasing short-term profit. Many companies will start to devote more efforts to increase their supply chain resilience to mitigate those risks and uncertainties and avoid supply disruptions. This is where this project originates.

2 Literature review

Supply chain resilience indicates supply chains' ability to absorb disruptions and restore to their original status or performance in an acceptable period after the unexpected shocks (Hendry et al., 2019). Supply chain resilience has been studied intensively from the operations management community among academics and practitioners (Ali et al., 2017; Altay and Ramirez, 2010; Brandon-Jones et al., 2014; Chowdhury and Quaddus, 2016; Dubey et al., 2018; Liu, 2020a; Lee et al., 2016; Mishra et al., 2016; Sreedevi and Saranga, 2017; Tang, 2006; Vlajic et al., 2013). Many previous studies in literature analysed different types of supply chain disruptions (Ivanov et al. 2017; Wagner and Bode, 2006), various causes that lead to supply chain disruptions (Craighead et al., 2007), the adverse impact of disruptions on performance (Hendricks and Singhal, 2005) as well as strategies of management in alleviating or preventing potential supply chain disruptions (Ivanov and Dolgui, 2018; Tang, 2006). Furthermore, many previous studies focused on exploring different strategies of managing disruptions to increase supply chain resilience (Tukamuhabwa et al., 2017). Those strategies discussed can be divided into two categories, proactive strategies and reactive strategies based on when they are deployed, before or after the disruptive events (Hendry et al., 2019; Li et al., 2019; Liu, 2020b; Tukamuhabwa et al., 2017).

Proactive strategies are preventive strategies relying on the development of inter-organisational infrastructures by using various measures and techniques. For example, high-level digital connectivity for prompt information sharing can help predict future risks and avoid potential disruptions (Ralston and Blackhurst, 2020; Hofmann et al., 2019; Jayaraman and Liu, 2019; Tan et al., 2019). Sourcing locally and regionally can be another strategy to reduce the length of the supply chain for more resilience (Iakovou et al., 2014). Zhu et al. (2017) discussed the rile of integrated approaches to effectively manage various risks across supply chains. Other strategies such as social supply chain (Iakovou et al., 2014) as well as human capabilities (Blackhurst et al., 2005) are also proposed in increasing supply chain resilience. Reactive strategies are those strategies focusing on how to deal with disruptions. For example, creating virtual marketplaces is proposed as an alternative way for supply chain continuity (Sharifi et al., 2006). The maintenance of transportation and logistics is discussed regarding its importance in improving supply chain resilience (Graveline and Grémont, 2017; Haraguchi and Lall, 2015; Ivanov et al., 2016; Liu et al., 2018). Some other strategies such as more safety stock with high-level inventory reservation (Lücker et al., 2019; Simchi-Levi et al., 2015) and business continuity plans after disruptions (Hernantes et al., 2017; Zsidisin et al., 2005) are also discussed in the literature.

3 Purpose of study

The objective of this study is to empirically identify proactive as well as reactive antecedents of a company's supply chain resilience and analyse the impact of supply chain resilience in enhancing a company's performance in the long run. Most supply chain research simply focused on the concepts, importance as well as characteristics of supply chain resilience theoretically without deeper investigation regarding the factors or components in improving supply chain resilience practically. There is an urgent need in proposing and testing theoretical models so as to identify the antecedents and consequences of supply chain resilience. Therefore, the objective of this project is to fill the above-stated gap in the literature by proposing a theoretical framework to analyse the underlying rationales or mechanisms and identify different management strategies that improve the resilience of supply chains and increase the company's performance accordingly. Building on the dynamic capabilities perspective, this research aims to identify those internal management capabilities that help improve a company's supply chain resilience and its impact on a company's financial performance in the long run. A conceptual framework and empirically test it by using a dataset collected from 278 companies in China. The structure of the rest paper is as follows. In Section 4, we describe the theoretical foundation used in proposing the framework and present our hypotheses. Section 5 describes the design of our research including data collection, scale validation and model estimation. In Section 6, we briefly discuss the results of our model estimation. Section 7 makes a brief conclusion and discusses the limitations of this study and future opportunities.

4 Theoretical foundation and hypothesis development

4.1 The perspective of dynamic capabilities

The theory of dynamic capabilities was developed to explain the nature of mechanisms that companies can sustain their competitive advantage over time (Lengnick-Hall and Wolff, 1999; Priem and Butler, 2001). The theory of dynamic capabilities indicates that rather than the idiosyncratic resources, a company's long-lasting competitive advantage originates from its actively and effectively acquiring, integrating and deploying various resources to satisfy the requirements of customers and market (Eisenhardt and Martin, 2000; Teece et al., 1997). The theory of dynamic capabilities indicates that there is not any type of static resources or capabilities that can sustain long-term competitive advantage, but the dynamic process long-term competitive advantage.

Supply chain resilience fits well into the adaptive nature emphasised by dynamic capabilities to adjust for external uncertainties. Various risks and uncertainties exist in each business process throughout the whole supply chain. All those risks and uncertainties have to be addressed to develop dynamic capabilities with resilient supply chains to satisfy customer's requirements with enhanced strategic performance.

4.2 Hypothesis development

As indicated earlier, although various internal as well external factors are important in affecting supply chain resilience, this study focuses on different aspects of a company's internal capabilities and identifies the factors that can improve supply chain resilience. From the perspective of dynamic capabilities, organisational studies have confirmed the importance of slack resources, flexibility, robustness to deal with market turbulence and other external dynamism in improving competitive advantages (Eisenhardt and Martin, 2000). Nowadays, the fast development of IT technology enables the availability of a large volume of information. It is important for companies to timely collect market-related information.

In this study, we analyse the four aspects of internal capabilities in improving supply chain resilience, operation flexibility, resource redundancy, operation robustness and information management proposed as follows.

4.2.1 Operation flexibility and supply chain resilience

From the perspective of dynamic capabilities, resilience emphasises the ability of a system make proper adjustments in response to unexpected situations and with adaptive capacity (Woods, 2006). To deal with unexpected supply disruption and achieve operation continuity, cross-training worker and using standard standardised parts or production processes can make the shift among the production of different products easily and improve operational flexibility. Operation flexibility has been regarded as one important aspect in increasing supply chain agility (Swafford et al., 2006). A company with operational flexibility can shift quickly among different types of products in response to dynamic uncertainties in the external environment. Supply chain resilience can be built through operation flexibility by dealing with procurement or supply disruption. Operation flexibility can increase a company's supply chain resilience by quickly adjusting its supply tactics and operations in response to external uncertainties and risks. So we hypothesise as to the following,

H_1 A company's operational flexibility helps improve its supply chain resilience.

4.2.2 Resource redundancy and supply chain resilience

In business operations, redundancy indicates the unused capacity and extra resources available for use given the normal production level. Sheffi and Rice (2005) indicate that creating resource redundancies for building organisational resilience. Resource redundancy is regarded as a type of cost or waste in the business field because some types of extra resources will lead to a high inventory level. The only advantage of resource redundancy is availability, which is essential to maintain operational stability and continuity. Therefore, building resource redundancy can help achieve resilience to deal with unexpected risks or crises. Extra supplies, unused capacity and multi-sourcing have been shown to be essential for resilience development (Dangayach and Deshmukh, 2001). Although there is a trade-off between the benefit and cost of resource redundancy, resource redundancy will be critical in improving the resilience to deal with various types of supplying risks and uncertainties (Linnenluecke and Griffiths, 2010). Therefore, we can hypothesise,

H_2 A company's resource redundancy helps improve its supply chain resilience.

4.2.3 Operation robustness and supply chain resilience

Operation robustness indicates smooth production with satisfying results under a variety of adverse conditions. Operation robustness is an essential factor to improve resilience by dealing with disruptions with enhanced reliability (Mangan et al., 2008). Normally, production variability is inevitable due to various common and assignable causes. Total quality management indicates the importance of robustness in improving quality and managing disruptions (Dean, 2010). Therefore, operation robustness will enhance a company's internal quality control to deal with variability and achieve lean production, which adds a high level of resilience to reduce supply chain variability (Christopher and Rutherford, 2004). Therefore, operation robustness plays an important role in improving supply chain resilience to create smooth production with consistent and solid quality. So we hypothesise,

H_3 A company's operation robustness helps increase its supply chain resilience.

4.2.4 Information management and supply chain resilience

Information technology plays a critical role in companies' operations by speeding up the flow of information for fast decision-making to avoid huge damage during crises and grasp great opportunities. Since various parties are involved in the whole supply chain, information management is important in improving the overall performance of the supply chain (Closs et al., 2005, Gunasekaran et al., 2011). Therefore, collecting and managing all related information is important to timely control and direct companies' operations under the dynamic context with unexpected risks and disruptions (Bodendorf and Zimmermann, 2005). Delayed or distorted information may lead to serious damage. Effective information management thus can enable companies to learn and prepare for the potential risks and crisis as early as possible so that companies can come up with their best responses to ensure their operation continuity. Therefore information management can increase companies' operation robustness and supply chain resilience with a prompt response system for potential disruptions.

H_4 Effective information management can improve a company's supply chain resilience.

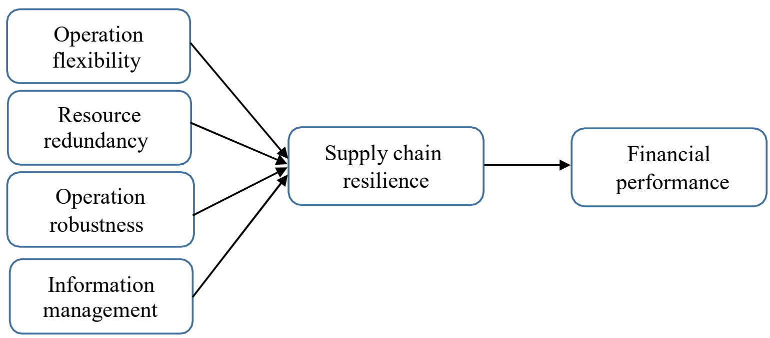
4.2.5 Supply chain resilience and financial performance

Companies with enhanced supply chain resilience continuously monitor the environment for unexpected changes such as supply disruptions and demand shifts. This timely monitoring enables companies to respond rapidly to those unexpected changes and restore to their original production level (Sheffi and Rice, 2005). This dynamic process increases companies' motivation to respond to the changes of the external business environment quickly and precisely and increase their management capabilities (Bode et al., 2011). From the perspective of dynamic capabilities, a company with high-level supply chain resilience can frequently make the adjustment to deal with external uncertainties and maintain a competitive advantage. Therefore, companies may achieve high-level financial performance by increasing their supply chain resilience. Given the foregoing, we make the following hypotheses:

H_5 A company's supply chain resilience helps improve its financial performance.

Figure 1 graphically shows the conceptual model regarding the hypothesised relationships discussed above.

Figure 1 Conceptual framework (see online version for colours)



5 Methodology

5.1 Data collection

This study employs a dataset collected from high-tech companies in China because the high-tech companies are influenced greatly by the various operating challenges from the external environment (Lewis and Harvey, 2001). Our research team interviewed the top managers of some companies to obtain necessary knowledge and information regarding their behaviours and business information related to supply chain and other related issues. Through the interactions, managerial issues regarding green operations and performance as well as relationships with other parties across the whole supply chain were discussed. Meanwhile, our research team also surveyed the literature for the measurement of constructs of interest. After our field visits and literature review, an initial questionnaire was developed with a set of items for each construct specified in our conceptual framework. After that, we discussed with some CEOs or senior managers about the survey questions. Necessary modifications were conducted based on their feedback. The modified questionnaire was tested again by another five company managers for clarity and specificity for each construct. The items of construct measurement are attached in the appendix.

For survey administration, a list of companies was constructed about the Chinese firms located in the Weihai Hi-tech Zone (WHHT), Shandong Province. The list includes a total of 300 high-tech companies. We called all 300 companies over the phone to ask for their participation with an assurance of anonymity. We also made an offer of the executive summary of our study after completion. Among those 300 companies, 276 respondents agreed to participate with 20 declined and 4 unavailable. In the end, the response rate is 92%.

Since each observation in our data set contains only one respondent, several methods are used to assess the risk of common method bias (Podsakoff and Organ, 1986). Firstly, we asked members of the top management team such as the CEO or other senior managers to complete the survey. Because the top management team carries sufficient information regarding the operations of their companies, the information provided by them is usually reliable, minimising the risk of common variance methods (CMV) (Miller and Roth, 1994). Secondly, when designing the questionnaire, we intentionally intersperse response variables among explanatory variables in order to minimise any clues which may be inferred by senior managers when completing the questionnaire. This measure can further reduce the risk of CMV. Thirdly, we use Harman's single factor test to assess the risk of CMV. The results of Harmon's test are as follows, RMSEA = 0.245, χ^2 = 1,298.75 (d.f. = 456), CFI = 0.356 and SRMR = 0.278. Based on the results, we can find that the single factor model is much worse than our confirmatory factor analysis model conducted below.

5.2 Measures and model estimation

We will analyse the data collected from the survey by using the factor model and estimate the hypotheses in the conceptual framework by structural equation modelling (SEM) methodology. The package employed for the estimation of SEM is Mplus 8.4. SEM will be used to analyse the survey data. SEM is a statistical tool that uses multivariate analysis to analyse structural relationships. SEM simultaneously unites confirmatory factor analysis and multiple regression analysis. It first evaluates the latent constructs by using measured variables collected using survey, then analyses the structural relationship systematically among those latent constructs by using multiple regressions. This method offered much flexibility for researchers because it estimates the multiple regressions and interrelated dependence in a single analysis by taking care of multicollinearity as well as endogeneity. The theoretical path model identifies four exogenous variables, operation flexibility, resource redundancy, operation robustness, information management and two endogenous variables, supply chain resilience and economic performance, with three or four indicators for each construct. The results of measurement for each construct are obtained from the measurement part of the SEM model as follows in Table 1.

Table 1 Measurement model results

Constructs	*Item*	*Completely standardised loadings*	*T-value*	*Item mean*	*S.D.*
Operation flexibility (OF)	OF1	0.776	Fixed	3.64	1.00
	OF2	0.820	10.85	3.64	1.03
	OF3	0.748	9.76	3.28	1.12
Resource redundancy (RR)	RR1	0.786	Fixed	3.75	0.99
	RR2	0.749	9.78	4.01	1.02
	RR3	0.796	10.05	4.06	0.98
Operation robustness (OR)	OR1	0.733	9.08	3.98	1.03
	OR2	0.764	10.72	3.88	1.10
	OR3	0.852	11.05	3.95	0.98
Information management (IM)	IM1	0.815	Fixed	3.89	1.04
	IM2	0.788	8.08	3.98	1.02
	IM3	0.849	10.55	4.06	1.01
	IM4	0.797	8.788	4.08	1.05
Supply chain resilience (SCR)	SCR1	0.801	Fixed	3.64	0.95
	SCR2	0.796	8.082	3.64	0.94
	SCR3	0.782	8.07	4.07	0.97
	SCR4	0.913	8.788	3.99	0.95
Economic performance (EP)	EP1	0.765	Fixed	4.02	0.89
	EP2	0.901	11.03	3.77	0.97
	EP3	0.711	8.78	4.23	0.92
	EP4	0.907	11.10	3.84	0.94

Notes: Fit indices: $\chi^2 = 758.9$; d.f. = 637; CFI = 0.975; TLI = 0.970; SRMR = 0.043; RMSEA = 0.040; sample size (n) = 276. All factor loading are significant at $p < 0.01$.

Validity test

We can see the standardised factor loadings for our latent constructs range from 0.711 to 0.913. The average variance extracted (AVE) for the six latent constructs (operation flexibility, resource redundancy, operation robustness, information management and two endogenous variables, supply chain resilience and economic performance) are, 0.61, 0.60, 0.62, 0.66, 0.68 and 0.68 respectively and all of them are larger than 0.5, indicating that the amount contributed to the latent constructs is larger for the observed variables than for the error in the measurement (Bentler and Wu, 1995). All these indicating a good fit. Moreover, we use Cronbach's alpha to assess the measurement reliability. The reliabilities for all constructs are over 0.8, which indicates the internal consistency for the measurement indicators of the latent constructs in our conceptual model.

6 Estimation results and discussion

The second part of the SEM gives the path estimation of our conceptual framework in Table 2.

Table 2 Structural model estimation

β_1 (OF → SCR) (H_1)	0.45**
β_2 (RR → SCR) (H_2)	0.37**
β_3 (OR → SCR) (H_3)	0.29**
β_4 (IM → SCR) (H_4)	0.25*
β_5 (SCR → EP) (H_5)	0.32**

Notes: ** significant at $p < 0.01$; * significant at $p < 0.05$.

The overall fit of the theoretical model was acceptable (χ^2 = 238.6; df = 176; NFI = 0.975; CFI = 0.982; RMSEA = 0.024), indicating a good overall fit. The value of RMSEA is 0.023 which is much lower than the literature suggested threshold 0.08 (Browne and Cudeck, 1993). The satisfactory values of NFI and CFI indicate a great fit improvement in the proposed model than the null model. SRMR also shows a good fit. Moreover, the ratio of chi-square to the degrees of freedom is satisfactory with the result much lower than the suggested threshold value of 2, which indicates a good fit as well (Segars and Grover, 1993).

Based on the results obtained from the SEM, we can see that all four proposed internal antecedents are positively associated with supply chain resilience. The path coefficients β1, β2, β3 and β4 are 0.45, 0.37, 0.29 and 0.25 respectively, with p-values less than 0.01 or 0.05. We can make a reasonable conclusion that operation flexibility, resource redundancy, operation robustness and information management play critical roles in improving a company's supply chain resilience. So hypotheses H_1, H_2, H_3 and H_4 are supported.

For the relationship between supply chain resilience and a company's economic performance, β5 = 0.32 with a p-value less than 0.01, indicating that the supply chain resilience has a positive impact on a company's economic performance, indicating that H_5 is supported.

7 Conclusions, contribution and limitations

As with any study, this study also has several limitations. First of all, a self-reported dataset is used in this study. Although the test results of various measures indicate that the risk of common method bias is not serious in this study, the outcomes of this study still need to be considered with reservation. Moreover, this study uses cross-sectional data and from a single region in Shandong Province, China. Longitudinal or multi-regional data from other provinces or countries can be used in the future to analyse the relationships specified here and push this study forward. Research has indicated that supply chain resilience is an important factor for companies to survive the adverse effects of unexpected disruptions and risks because not all those disruptions can be avoided (Brandon-Jones et al., 2014). With supply chain resilience, companies can properly deal with the adverse impacts of disruptions to continuously serve their customers (Scholten and Schilder, 2015). As indicated earlier, most studies in the literature analyse the impact of supply chain resilience on a company's performance and simply focused on the concepts, importance as well as characteristics of supply chain resilience theoretically without deeper investigation regarding the factors or components in improving supply chain resilience practically. This study aims to fill this gap by empirically finding effective ways to improving a company's supply chain resilience.

The results of this study shed some light on finding ways to improve supply chain resilience and improve performance. Supply chain resilience has been articulated in literature respectively regarding their roles in improving organisational performance. However, most supply research simply focused on the concepts, importance as well as characteristics of supply chain resilience theoretically without deeper investigation regarding the factors or components in improving supply chain resilience practically. Building on the theory of dynamic capabilities, this study extends the extant literature by identifying proactive as well as reactive ways to improve supply chain resilience. The findings in this study provide the basis for some theoretical and managerial insights regarding dealing with disruptive events and improving the resilience of supply chains.

First, this study applies theories in management literature by presenting a conceptual model under the context of global sourcing to investigate the complex multi-stages supply chains. This study proposed an empirical framework to analyse the underlying mechanisms and rationales and identifies different factors that contribute to supply chain resilience and find out how a company's overall performance will be impacted indirectly. The empirical analyses in this study support all the proposed hypotheses, indicating that the four internal factors operation flexibility, resource redundancy, operation robustness and information management are likely to help improve supply chain resilience. Moreover, this study also confirms the result in the literature that supply chain resilience can improve a company's financial performance. This study provides a useful reference for future studies regarding the interrelationships among antecedents, supply chain resilience and performance in under global sourcing context. Secondly, this result provides sourcing managers with useful guidelines and directions to properly manage the multi-tier supply chains in order to mitigate the potential risks and uncertainties involved, avoid supply disruptions and improve performance. Moreover, although many of the implications hold for the buyers over the supply chain, the insights may also be useful for suppliers. Under the global sourcing context, the suppliers could increase communications with their buyers regarding their foreseen risks and uncertainties to help their customers reduce any potential supply disruptions and improve supply resilience.

As with any study, several limitations exist in this study. The first one is the self-reported dataset used in this study. Although common method bias is not a major concern here suggested by the test results of various measures, the findings of this study still need to be considered with reservation. Furthermore, the data used in this study are cross-sectional and from a single region in Shandong Province, China. Longitudinal or multi-regional data from other regions or countries can be used in the future to verify the relationships specified here and push this study forward. Second, only internal factors are studied here. Future studies can focus on external factors that help improve supply chain resilience. Third, most companies are facing various inter-organisational relationships over their supply chains. How to properly coordinate and govern these inter-organisational relationships to achieve effective integration is helpful in improving supply chain resilience. Identifying proper governance mechanisms in the coordination of the inter-organisational relationship for high-level supply chain resilience is another promising direction for future research.

References

Ali, I., Nagalingam, S. and Gurd, B. (2017) 'Building resilience in SMEs of perishable product supply chains: enablers, barriers and risks', *Production Planning & Control*, Vol. 28, No. 15, pp.1236–1250.

Altay, N. and Ramirez, A. (2010) 'Impact of disasters on firms in different sectors: implications for supply chains', *Journal of Supply Chain Management*, Vol. 46, No. 4, pp.59–80.

Bentler, P.M. and Wu, E.J.C. (1995) *EQS/Windows User's Guide*, BMDP Statistical Software, Los Angeles.

Blackhurst, J., Craighead, C.W., Elkins, D. and Handfield, R.B. (2005) 'An empirically derived agenda of critical research issues for managing supply-chain disruptions', *International Journal of Production Research*, Vol. 43, No. 19, pp.4067–4081.

Bode, C., Wagner, S.M., Petersen, K.J. and Ellram, L.M. (2011) 'Understanding responses to supply chain disruptions: Insights from information processing and resource dependence perspectives', *Academy of Management Journal*, Vol. 54, No. 4, pp.833–856.

Bodendorf, F. and Zimmermann, R. (2005) 'Proactive supply-chain event management with agent technology', *International Journal of Electronic Commerce*, Vol. 9, No. 4, pp.57–89.

Browne, M.W. and Cudeck, R. (1993) 'Alternative ways of assessing model fit', in Bollen, K.A. and Long, J.S. (Eds.): *Testing Structural Equation Models*, pp.136–162, Sage, Newbury Park, CA.

Brandon-Jones, E., Squire, B., Autry, C.W. and Petersen, K.J. (2014) 'A contingent resource-based perspective of supply chain resilience and robustness', *Journal of Supply Chain Management*, Vol. 50, No. 3, pp.55–73.

Chowdhury, M.M.H. and Quaddus, M. (2016) 'Supply chain readiness, response and recovery for resilience', *Supply Chain Management: An International Journal*, Vol. 21, No. 6, pp.709–731.

Christopher, M. and Lee, H. (2004) 'Mitigating supply chain risk through improved confidence', *International Journal of Physical Distribution & Logistics Management*, Vol. 34, No. 5, pp.388–396.

Christopher, M. and Rutherford, C. (2004) 'Creating supply chain resilience through agile Six Sigma', *Critical Eye*, June–August, pp.24–28. [online] https://www.criticaleye.com/inspiring/insights-servfile.cfm?id=236 (accessed August 2020).

Closs, D.J., Swink, M. and Nair, A. (2005) 'The role of information connectivity in making flexible logistics programs successful', *International Journal of Physical Distribution and Logistics Management*, Vol. 35, No. 4, pp. 258–277.

Craighead, C.W., Blackhurst, J., Rungtusanatham, M.J. and Handfield, R.B. (2007) 'The severity of supply chain disruptions: design characteristics and mitigation capabilities', *Decision Sciences*, Vol. 38, No. 1, pp.131–156.

Dangayach, G.S. and Deshmukh, S.G. (2001) 'Practice of manufacturing strategy: evidences from select Indian automobile companies', *International Journal of Production Research*, Vol. 39, No. 11, pp.2353–2393.

Dean, D. (2010) *ACEO's Guide for Reenergizing the Senior Team*, McKinsey Quarterly [online] https://www.mckinsey.com/business-functions/organization/our-insights/a-ceos-guide-to-reenergizing-the-senior-team (accessed August 2020).

Dubey, R., Altay, N., Gunasekaran, A., Blome, C., Papadopoulos, T. and Childe, S.J. (2018) 'Supply chain agility, adaptability and alignment: empirical evidence from the Indian auto components industry', *International Journal of Operations & Production Management*, Vol. 38, No. 1, pp.129–148.

Eisenhardt, K. and Martin, J. (2000) 'Dynamic capabilities: what are they?', *Strategic Management Journal*, Vol. 21, Nos. 10–11, pp.1105–1121.

Graveline, N. and Gr'emont, M. (2017) 'Measuring and understanding the microeconomic resilience of businesses to lifeline service interruptions due to natural disasters', *International Journal of Disaster Risk Reduction*, Vol. 24, pp.526–538.

Gunasekaran, A., Rai, B.K. and Griffin, M. (2011) 'Resilience and competitiveness of small and medium size enterprises: an empirical research', *International Journal of Production Research*, Vol. 49, No. 18, pp.5489–5509.

Haraguchi, M. and Lall, U. (2015) 'Flood risks and impacts: a case study of Thailand's floods in 2011 and research questions for supply chain decision making', *International Journal of Disaster Risk Reduction*, Vol. 14, pp.256–272.

Hendricks, K.B. and Singhal, V.R. (2005) 'An empirical analysis of the effect of supply chain disruptions on long-run stock price performance and equity risk of the firm', *Production and Operations Management*, Vol. 14, No. 1, pp.35–52.

Hendry, L.C., Stevenson, M., MacBryde, J., Ball, P., Sayed, M. and Liu, L. (2019) 'Local food supply chain resilience to constitutional change: the Brexit effect', *International Journal of Operations Production Management*, Vol. 39, No. 3, pp.429–453.

Hernantes, J., Labaka, L., Turoff, M., Hiltz, S.R. and Ba˜nuls, V.A. (2017) 'Moving forward to disaster resilience: perspectives on increasing resilience for future disasters', *Technological Forecasting and Social Change*, Vol. 121, pp.1–6.

Hofmann, E., Sternberg, H., Chen, H., Pflaum, A. and Prockl, G. (2019) 'Supply chain management and Industry 4.0: conducting research in the digital age', *International Journal of Physical Distribution Logistics Management*, Vol. 49, No. 10, pp.945–955.

Iakovou, E., Vlachos, D., Keramydas, C. and Partsch, D. (2014) 'Dual sourcing for mitigating humanitarian supply chain disruptions', *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 4, No. 2, pp.245–264.

Ivanov, D. and Dolgui, A. (2018) 'Low-certainty-need (LCN) supply chains: a new perspective in managing disruption risks and resilience', *International Journal of Production Research*, Vol. 57, Nos. 15-16, pp.1–18.

Ivanov, D., Dolgui, A., Sokolov, B. and Ivanova, M. (2017) 'Literature review on disruption recovery in the supply chain', *International Journal of Production Research*, Vol. 55, No. 20, pp.6158–6174.

Ivanov, D., Pavlov, A., Dolgui, A., Pavlov, D. and Sokolov, B. (2016) 'Disruption-driven supply chain (re)-planning and performance impact assessment with consideration of pro-active and recovery policies', *Transportation Research Part E: Logistics and Transportation Review*, Vol. 90, pp.7–24.

Jayaraman, V. and Liu, Z. (2019) 'Aligning governance mechanisms with task features to improve service capabilities—an empirical study of professional service outsourcing in India', *Operations Management Research*, Vol. 12, Nos. 1-2, pp.19–39.

Lee, B.K., Zhou, R., de Souza, R. and Park, J. (2016) 'Data-driven risk measurement of firm-to-firm relationships in a supply chain', *International Journal of Production Economics*, Vol. 180, pp.148–157.

Lengnick-Hall, C.A. and Wolff, J.A. (1999) 'Similarities and contradictions in the core logic of three strategy research streams', *Strategic Management Journal*, Vol. 20, No. 12, pp.1109–1132

Lewis, G.J. and Harvey, B. (2001) 'Perceived environmental uncertainty: the extension of Miller's scale to the natural environment', *Journal of Management Studies*, Vol. 38, No. 2, pp.201–233.

Linnenluecke, M. and Griffiths, A. (2010) 'Beyond adaptation: resilience for business in light of climate change and weather extremes', *Business and Society*, Vol. 49, No. 3, pp.477–511.

Li, P., Menon, M. and Liu, Z. (2019) 'Green Innovation Under Uncertainty – A Dynamic Perspective', *International Journal of Services, Economics and Management*, Vol. 10, No. 1, pp.68–88.

Liu, Z. (2020a) 'Unraveling the complex relationship between environmental and financial performance ─ A multilevel longitudinal analysis', *International Journal of Production Economics*, Vol. 219, pp.328–340.

Liu, Z. (2020b) 'Identifying the antecedents of internal integration in improving green product innovation', *International Journal of Services, Economics and Management,* Vol. 11, No. 3, pp.256–273.

Liu, Z., Wang, H. and Li, P. (2018) 'The antecedents of green information system and impact on environmental performance', *International Journal of Services, Economics and Management*, Vol. 9, No. 2, pp.111–124.

Lücker, F., Seifert, R.W. and Biçer, I. (2019) 'Roles of inventory and reserve capacity in mitigating supply chain disruption risk', *International Journal of Production Research*, Vol. 57, No. 4, pp.1238–1249.

Mangan, J., Lalwani, C. and Fynes, B. (2008) 'Port-centric logistics', *The International Journal of Logistics Management*, Vol. 19, No. 1, pp.29–41.

Miller, J.G. and Roth, A.V. (1994) 'A taxonomy of manufacturing strategies', *Management Science*, Vol. 40, No. 3, pp.285–304.

Mishra, D., Sharma, R.R.K., Kumar, S. and Dubey, R. (2016) 'Bridging and buffering: strategies for mitigating supply risk and improving supply chain performance', *International Journal of Production Economics*, Vol. 180, pp.183–197.

Podsakoff, P.M. and Organ, D.W. (1986) 'Self–reports in organizational research: problems and prospects', *Journal of Management*, Vol. 12, No. 4, pp.531–544.

Priem, R.L. and Butler, J. E. (2001) 'Is the resource–based 'view' a useful perspective for strategic management research?', *Academy of Management Review*, Vol. 26, No. 1, pp.22–40.

Ralston, P. and Blackhurst, J. (2020) 'Industry 4.0 and resilience in the supply chain: a driver of capability enhancement or capability loss?', *International Journal of Production Research*, Vol. 58, No. 16, pp.5006–5019.

Scholten, K. and Schilder, S. (2015) 'The role of collaboration in supply chain resilience', *Supply Chain Management: An International Journal*, Vol. 20, No. 4, pp.1–29

Segars, A.H. and Grover, V. (1993) 'Re–examining perceived ease of use and usefulness: a confirmatory factor analysis', *MIS Quarterly*, Vol. 17, No. 4, pp.517–527.

Sharifi, H., Kehoe, D. and Hopkins, J. (2006) 'A classification and selection model of e-marketplaces for better alignment of supply chains', *Journal of Enterprise Information Management*, Vol. 19, No. 5, pp.483–503.

Sheffi, Y. and Rice Jr., J.B. (2005) 'A supply chain view of the resilient enterprise', *MIT Sloan Management Review*, Vol. 47, No. 1, pp.41–48.

Shih, W. (2020) 'Is it time to rethink globalized supply chains?', *MIT Sloan Management Review*, 19 March, Vol. 61, No. 4, pp.1–3.

Simchi-Levi, D., Schmidt, W., Wei, Y., Zhang, P.Y., Combs, K., Ge, Y., Gusikhin, O., Sanders, M. and Zhang, D. (2015) 'Identifying risks and mitigating disruptions in the automotive supply chain', *Interfaces (Providence)*, Vol. 45, No. 5, pp.375–390.

Sreedevi, R. and Saranga, H. (2017) 'Uncertainty and supply chain risk: the moderating role of supply chain flexibility in risk mitigation', *International Journal of Production Economics*, Vol. 193, pp.332–342.

Swafford, P.M., Ghosh, S. and Murthy, N. (2006) 'The antecedents of supply chain agility of a firm: scale development and model testing', *Journal of Operations Management*, Vol. 24, No. 2, pp.170–188.

Tan, W.J., Cai, W. and Zhang, A.N. (2019) 'Structural-aware simulation analysis of supply chain resilience', *International Journal of Production Research*, Vol. 58, No. 17, pp.5175–5195.

Tang, C.S. (2006) 'Perspectives in supply chain risk management', *International Journal of Production Economics*, Vol. 103, No. 2, pp.451–488.

Teece, D. Pisano, G. and Shuen, A. (1997) 'Dynamic capabilities and strategic management', *Strategic Management Journal*, Vol. 18, No. 7, pp.509–533.

Tomlin, B. (2006) 'On the value of mitigation and contingency strategies for managing supply chain disruption risks', *Management Science*, Vol. 52, No. 5, pp.639–657.

Tukamuhabwa, B., Stevenson, M. and Busby, J. (2017) 'Supply chain resilience in a developing country context: a case study on the interconnectedness of threats, strategies and outcomes', *Supply Chain Management: An International Journal*, Vol. 22, No. 6, pp.486–505.

Vlajic, J.V., van Lokven, S.W., Haijema, R. and van der Vorst, J.G. (2013) 'Using vulnerability performance indicators to attain food supply chain robustness', *Production Planning & Control*, Vol. 24, Nos. 8-9, pp.785–799.

Wagner, S.M. and Bode, C. (2006) 'An empirical investigation into supply chain vulnerability', *Journal of Purchasing and Supply Management*, Vol. 12, No. 6, pp.301–312.

Woods, D.D. (2006) 'Essential characteristics of resilience for organizations', in Hollnagel, E., Woods, D.D. and Leveson, N. (Eds.): *Resilience Engineering: Concepts and Precepts*, pp.21–34, Ashgate, Aldershot, UK.

Zhu, Q., Krikke, H. and Caniels, M.C. (2017) 'Integrated supply chain risk management: a systematic review', *International Journal of Logistics Management*, Vol. 28, No. 4, pp.1123–1141.

Zsidisin, G., Melnyk, S. and Ragatz, G.L. (2005) 'An institutional theory perspective of business continuity planning for purchasing and supply management', *International Journal of Production Research*, Vol. 43, No. 16, pp.3401–3420.