Supply Chain Risk Management Practices During Covid 19 In The Indonesian Manufacturing Industry On Supply Chain Robustness And Resilience

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The lockdown and limitation of mobility during COVID-19 outbreak resulted in decreasing The objective of this paper is to explore the practice of Supply Chain Risk Managemen (SCRM) in disruption impact due to COVID-19 pandemic. This research is using basic tenets of resource-based view as well as insight into the current state of the supply chain risk management and the relationship between supply chain resilience and robustness. Data from the survey of Indonesian manufacture of automotive related were analyzed. The study were intended to study effect of pandemic strike to effectiveness their supply chain based on their purposed risk management through their supply chain. The results confirm that risk management factors such identification, assesment, mitigation and control positively had a contribution to their supply chain effectiveness. The results also show the need for organizations to more asses comprehensive SCRM framework and contribute to extent suggestion for further research.

Supply Chain Risk Management (SCRM), Supply Chain Disruption, Covid-19 Impact, Automotive Supply Chain

1. Introduction

The Coronavirus Disease 2019 (Covid-19) pandemic has had a tremendous impact on the health, humanity, economy and stability of the global financial system. According to the World Trade Organization, global trade has fallen by 10 - 32% in 2020 (Flores and Shields, 2020). Recently, the Coronavirus (COVID-19) outbreak has affected numerous global SCs availability (Araz et al., 2020). The disruptions effects of COVID-19 impacted the global economy and paralyzed several industries (Ivanov, 2020).Various industrial trends including outsourcing, supply base reduction, just-in-time, and shorter product life cycles have increased firm exposure to supply chain risks (SCRs) (Colicchia and Strozzi, 2012; Trkman et al., 2016). These risks may result from man-made problems or natural disasters, and can have major consequences for organisations including financial and operational problems, potentially leading to business discontinuity (Craighead et al., 2007; Rajesh et al., 2015). Within the SCR literature, supply chain risk management (SCRM) has become a key area of interest. SCRM is aimed at developing strategies for the identification, assessment, treatment, and monitoring of risks in supply chains (e.g. Neiger et al., 2009; Tummala and Schoenherr, 2011; Ho et al., 2015)

Nevertheless, some recent studies argue that while COVID-19 is a catalyst for firms to revisit their existing supply chain strategies, short-term actions can be implemented to respond to or mitigate the immediate challenges (Mollenkopf et al., 2020; Rizou et al., 2020; Ivanov and Dolgui, 2020; Ivanov and Das, 2020; Govindan et al., 2020). For instance Ivanov (2020) states that firms can perhaps respond to the supply chain disruptions caused by

COVID-19 by explicitly focusing on tier 1 suppliers only. These studies further suggest that firms should expeditiously work with tier-1 suppliers to understand the level of inventory and production orders to respond to any abrupt changes.

According to official statistics on World bank (2021), over 3.8 million people have died from COVID as of May 2021. The global economy experi-enced one of the most severe recessions, shrinking by 3.5 percent in 2020 compared to 1.7 percent in 2009 during the global financial crisis. The recession in Indonesia (-2.1 percent) was milder than among Emerging Markets and Developing Economies, EMDEs (-4.3 percent excluding China). About 1.8 million Indonesians became unemployed between February 2020 and 2021 and another 3.2 million people exited the labour force. New COVID-19 cases have declined, though pandemic related risks loom large. Although new cases have declined from their peak in January-February. Nevertheless, Indonesia remains vulnerable to new waves driven by more transmissible strains as experienced by other countries as well as potentially higher mobility and viral transmission during festivities.

Ivanov and Dolgui (2020) call for more empirical research on SC resilience and robustness to elucidate how firms facing COVID-19 threats might develop survival mechanisms to mitigate the epidemic's threats. Likewise, van Hoek (2020) highlights SC managers' difficulties to operationalize the concepts of risk management and SC resilience and urges researchers to conduct empirical research to examine how SC managers are dealing with COVID-19 challenges. As defined by Emma et al., (2014) resilience as the ability of a supply chain to return to normal operating performance, within an acceptable period of time, after being disturbed and supply chain robustness as the ability of the supply chain to maintain its function despite internal or external disruptions.

Regarding our field of study, we decided to conduct our research on Indonesia Automotive Manufacturing Industry for several reason. First, Indonesia is the largest economy in Southeast Asia, the world's 10th largest economy in terms of purchasing power parity (World Bank, 2021). Second, the contribution of the manufacturing industry sector towards becoming the leading sector which contributes the largest to Gross Domestic Product of 19.7% in 2019 and 20.79% in 2020 compared to other sectors. The decline in domestic and foreign demand as well as restrictions on the mobility of goods, services and labor caused a contraction in the manufacturing industry sector of 2.93 percent in 2020. The impact, apart from being able to cause the Indonesian economy to contract, is to increase the unemployment rate and poverty in Indonesia.

This Special Issue was established to furnish fresh and extend the existing insights in the ripple effect in SCs regarding the following questions:

RQ1. Do COVID-19 disruption impacts affect supply chain risk management practices, supply chain robustness and resilience of Indonesia Automotive Manufacturing Industry?

RQ2. Do supply chain risk management practices of Indonesia Automotive Manufacturing Industry impact their supply chain robustness and resilience?

RQ3. Can supply chain risk management practices of Indonesia Automotive Manufacturing Industry mitigate the COVID-19 disruptions impacts on their supply chain robustness and resilience?

1.1 Objectives

The COVID-19 outbreak has put the resilience and robustness of SCs to the test in several industries with shortages in supply, lack of reactivity and production stops (Ivanov and Dolgui, 2020). Therefore, there is a need to assess how firms might deploy SC risk management (SCRM) processes to cope with the disruption impacts of COVID-19 outbreak. Second, this paper makes several insight on how supply chain risk management practice can be enhanced and make a good use if impact for supply chain occurred from the perspectives of resilience and robustness in the supply chains in a post-COVID world.

2. Literature Review

To theoretically investigate the role of SCRM practices in reducing disruption impacts on SC resilience and robustness, we draw on RBV and Dynamic Capabilites theories. It is not a big surprise that the world is in constant change, as Wind and Main (1998) claim in Balaton (2007: p. 9.), "the most risky strategy nowadays is the passivity". For most of the firms to obtain sustainable competitive advantage in actual competitive environments is such a great challenge, and the deployment of resources and capabilities are critical for getting and maintaining a good position among competitors. In words of Balaton (2007) "capability for change becomes a synonym of efficiency and competitiveness." With that in mind, it is straightforward to see that the role of managers and leaders in different industries is clue for the mentioned deployment of resources and capabilities. The way they decide, the way they combine and the way they change faster than industry pace will keep them alive.

2.1 Resource Based View

RBV strategy focuses on the optimization of the role of resources and capabilities as the principal basis for a sustainable competitive advantage (SCA). The RBV is a theory centered on the nature of firms based on its resources, as opposed to theories such as transaction cost economics, which seeks to explain the reason why firms exist (Lockett – Thompson – Morgenstern, 2009). Another way to define the RBV is as a determined collection of assets or resources that are tied "semi-permanently" to the firm (Jose,2015). Resources can be classified as: physical capital resources, human capital resources and organizational capital resources (Barney, 1991). The coordination of all these resources can improve the firms' performance and competitiveness (Hart and Dowell,2011).

2.2 Dynamic Capabilities

Prior research (e.g. Golgeci and Ponomarov, 2013; Ponomarov and Holcomb, 2009; Sheffi and Rice, 2005) has viewed SCR as a dynamic capability enabling the supply chain to effectively adapt, respond, and recover from disruptions (Blackhurst et al., 2011; Juttner and Maklan, 2011). A dynamic capability is "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997, pp.516) and is embedded as a process or set of processes associated with resource manipulation (Eisenhardt and Martin, 2000). More specifically, a dynamic capability is a pattern of activity through which the organization modifies operating routines for purposes of improved effectiveness (Zollo and Winter 2002). Dynamic capabilities are considered as repetitive behaviors that are learned and based in part on tacit knowledge which allow firms to build competitive advantage (Winter 2003). Dynamic capabilities are sometimes considered as an abstract concept lacking specific components (Pavlou and El sawy, 2011), difficult to measure (Mulders and Romme, 2009) and can only be observed a posteriori (Easterby Smith et al., 2009).

RBV and dynamic capabilities constitute a relevant framework to examine how firms coordinate their resources and capabilities in response to SC risks (Ojala and Hallikas, 2006; Tsai et al., 2008; Fan and Stevenson, 2018; Chowdhury and Quaddus, 2017). In this optic, firms need to realign their resources and processes (Sirmon et al., 2007; Eddleston et al., 2008; Blackhurst et al.,)

2.3 SCRM

It has been suggested that risk identification, risk assessment, risk treatment, and risk monitoring represent the four main stages of the SCRM process (Zsidisin et al., 2005; Hachicha and Elmsalmi, 2014). This is in accordance with the main stages defined in ISO 31000 (2009), an alternative approach. These four stages have been used to classify the definitions of SCRM (Ivanov,2017). This corresponds to the main stages defined in ISO 31000 (2009), an alternative approach. These four stages have been used to classify the definition of SCRM (Ivanov, 2017). While the probability that a serious incident will occur in a given location is rather small, the number of companies that are part of a supply chain results in an increased cumulative probability of a disruption occurring at some point in a given supply chain that will result in a negative impact on other members of their supply chain network (Sheffi, 2005).

3. Methods

3.1 Research Design

The data was collected through a survey conducted in 2021 on the Automotive Manufacturing industry based in West Java, Indonesia. The survey measurement items were designed and developed from various literatures that discuss the effect of supply chain risk management applications on supply chain performance of companies. Once integrated, the survey is given online to the supply chain person in charge of the company for the purpose of the study. We received 93 surveys which were distributed to supply chain managers in various manufacturing industry companies in Indonesia. The data is then validated and its reliability is measured.

3.2 Construct Measure

3.2.1 Supply Chain Risk Management

Referring to the existing literature, Fan and Stevenson (2018) provide a comprehensive SCRM framework consisting of identification, assessment, mitigation, and monitoring of SC risks. Thus, the goal of the SCRM Process is to limit the effects of SC disturbances that impede the continuity of material and information flow within the SC (Bode et al., 2011; Chowdhury and Quaddus, 2017; Craighead et al., 2007). Facing various threats of risk and disruption, companies tend to develop SCRM practices that involve four interrelated processes (Fan and Stevenson, 2018; Kırılmaz and Erol, 2016; Wieland and Wallenburg, 2012).

The first step in SCRM practice concerns risk identification (Kleindorfer and Saad, 2005; Wieland and Wallenburg, 2012) through routine screening of potential SC risks (Buhman et al., 2005).

Risk assessment can be identified as an evaluation of the occurrence of a risk including an estimate of its impact (Kleindorfer and Saad, 2005; Schmitt and Singh, 2009; de Souza et al., 2009). This process seeks to provide an in-depth understanding of information about risks and vulnerabilities in relation to risk and triggering events (Kleindorfer and Saad, 2005; Manuj and Mentzer, 2008; Wieland and Wallenburg, 2012).

Risk mitigation seeks to address the risk of significant change with appropriate measures through strategies before the disturbance occurs or through contingency plans after the event occurs (Chopra et al., 2007). The efficiency of risk mitigation depends on close collaboration with SC partners and recognition of the importance of SCRM practices within the company (Fan and Stevenson, 2017; Wieland and Wallenburg, 2012).

Risk control is concerned with reducing the frequency and impact of disruption risks; it is necessary to evaluate the performance of SCRM practices (Berg et al., 2008; Wieland and Wallenburg, 2012). Risk control through a systematic process, readiness, employee risk awareness, standardized in the procedures and plans outlined (Berg et al., 2008; Manuj and Mentzer, 2008). Given that the COVID-19 disruption of SCs has damaged several SCs (Araz et al., 2020; Ivanov, 2020), the way companies manage their processes including their SCRM processes, we propose the following hypothesis:

H1. The impact of COVID-19 negatively affects chain risk management practices, namely risk identification (H1a), risk assessment (H1b), risk mitigation (H1c) and risk control (H1d).

3.2.2 COVID-19 Disruption Impact On Supply Chain Resillience And Robustness

In the context of the COVID-19 outbreak, the survival of enterprises and growth in this turbulent period have become pressing issues for scholars (Ivanov, 2020; Ivanov and Dolgui, 2020) and practitioners (van Hoek, 2020).

The main difference between the concepts of resilience and resilience lies in the fact that Resilient relates to a firm's ability to maintain its planned performance after the impact of a disturbance (or series of disturbances) (Nair and Vidal, 2011; Simchi-Levi et al., 2018), whereas resilience concerns the ability to restore performance after absorbing disturbance effects (Spiegler et al., 2012; Hosseini et al., 2019). Based on the above arguments, we propose the following hypothesis:

H2. The impact of COVID-19 negatively affects supply chain resilience.

H3. The impact of COVID-19 negatively affects supply chain resilience.

3.2.3 COVID-19 Disruption Impact , Supply Chain Risk Management, And Supply Chain Resillience And robustness

In high-impact situations, the enterprise's ability to reconfigure resources may act as a mechanism to develop resilience and robustness to SC disruption

In other words, the impact of disruption affects SCRM practices, which in turn affects the resilience and robustness of SC. Based on the previous arguments, and considering various SCRM practices, our study tested the following hypotheses:

H.4. Supply chain resilience is positively influenced by supply chain risk management practices, namely risk identification (H4a), risk assessment (H4b), risk mitigation (H4c) and risk control (H4d).

H.5. Supply chain resilience is positively influenced by supply chain risk management practices namely Risk Identification (H5a), Risk Assessment (H5b), Risk Mitigation (H5c) and Risk Control (H5d). The research model is shown in Fig. 1

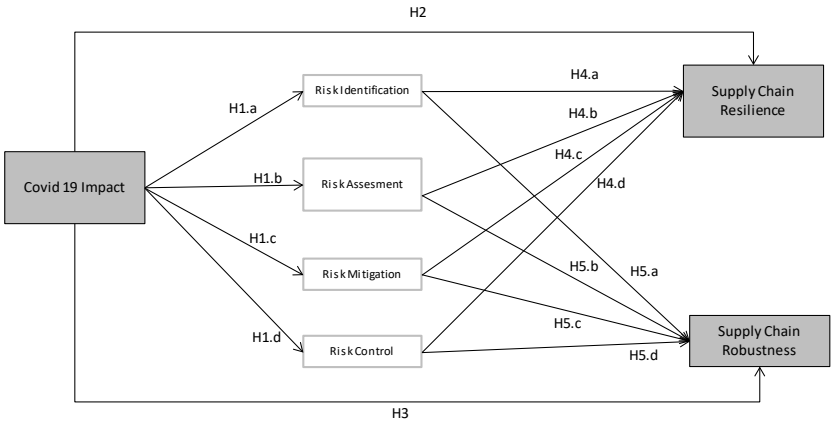

Figure 1. Conceptual Research Model

4. Data Collection

Collected responses exceed the sufficient range for the least squares Partial Least Square – Structural Equation Modeling (PLS-SEM). Following the recommendations of Wong (2013), the analysis was based, namely, a minimum R2 value of 0.25, statistical power of 80%, and a maximum of 4 predictors for SC toughness and resilience that the minimum sample size was 65. For the estimate for a minimum R2 of 0.25, the sample size 83 it can be said that the statistical power achieved through the study sample size is already meeting the recommended requirements.

The anonymity of the respondents was guaranteed, and the questions formulated were explained in detail to avoid ambiguity. After data collection, we conducted an analysis of the validity of the data to avoid bias from the questions asked.

Table 1. Demographic Respondent

Respondent characteristic (n= 93)	Total	Precentage
Kind of industry		
Automobile roda 4 dan lebih	17	18%
Automotive roda 2	11	12%
Electronics	12	13%
Fabricated metal product	22	24%
Rubber and plastics	16	17%
Others	15	16%
Labor Size		
1- 500	11	12%
501 - 1000	32	34%
1000 - 2000	17	18%
Diatas 2000	33	35%
Annual Sales (In Million Dollar)		
10 - 50	5	5%
50 - 100	45	48%
Above 100	43	46%
Company Own		
100% Foreign	45	48%
Joint venture Foreign - Local	35	38%
Local Company	13	14%
Years Work		
Below 5	41	44%
5-10	37	40%
10 - 15	11	12%
Above 15	4	4%
Current Job Title		
BOD	2	2%
Manager up	25	27%
Supervisor / Chief	45	48%
Staff	21	23%

5. Results and Discussion

5.1 Measurement model assessment

Our research model was analyzed in a data-background manner (Chenhall, 2012; Nitzl, 2016) in adequacy with the PLS-SEM approach using SmartPLS 3.3.5. In this study, the model was analyzed following a two-step approach: (i) assessment of the reliability and validity of the measurement model, and (ii) testing of the structural model (Chin, 2010). The item validity test was carried out, because all the outer values were above the 0.70 threshold and both the Dillon-Goldstein rho (reliability composite) and the Cronbach Alpha values were above the lower limit of 0.60 (Hair et al., 2017).

Table 2. Validity Test

Construct Variable		Loadings	Cronbach alpha	Composite Reliability
COVID-19 Disruption Impact			0.71	0.829
	Imp 1	0.908		
	Imp 2	0.894		
	Imp 3	0.617		
Risk Identification			0.812	0.877
	RI 1	0.724		
	RI 2	0.785		
	RI 3	0.869		
Risk Assesment			0.904	0.929
	RA 1	0.836		
	RA 2	0.831		
	RA 3	0.888		
	RA 4	0.854		
Risk Mitigation			0.835	0.901
	RM 1	0.884		
	RM 2	0.898		
	RM 3	0.819		
Risk Control			0.876	0.916
	RC 1	0.792		
	RC 2	0.836		
	RC 3	0.898		
	RC 4	0.889		
SC Resillience			0.865	0.908
	Res 1	0.845		
	Res 2	0.863		
	Res 3	0.886		
	Res 4	0.776		
	Res 5	0.742		
SC Robustness			0.745	0.832
	Rob 1	0.686		
	Rob 2	0.683		
	Rob 3	0.852		
	Rob 4	0.836		
	Rob 5	0.765		
	Rob 6	0.715		

To check discriminant validity, we follow two approaches. Next, we examine the criteria of Fornell and Larcker (1982), which requires the square root of the AVE for each item construct to be higher than its correlation with all other constructs. Table 3 shows that these criteria were met for all constructs.

Table 3. Fornel-Lecker

	Covid	SC	Risk	Risk	Risk	Risk	SC
Covid Impact	**0.701**						
Resillience	-0.011	**0.834**					
Risk Assesment	-0.133	0.450	**0.915**				
Risk Control	-0.008	0.612	0.358	**0.853**			
Risk	-0.172	0.557	0.782	0.474	**0.853**		
Risk Mitigation	-0.126	0.467	0.822	0.272	0.777	**0.830**	
Robustness	-0.069	0.828	0.371	0.318	0.573	0.395	**0.819**

We assessed the quality of the structural model (Table 4). Disruption impact describes three SCRM practices that have R2 (0.56, 0.57 and 0.54) according to Hair et al. (2017); while one of them (identifies) has a limited R2 (0.051). Four SCRM practices describe 0.285 SC Resillience and 0.200 SC Robustness.

Table 4. Structural Model Quality

	R^2	Q^2
Risk Identification	0.051	0.029
Risk Assesment	0.560	0.402
Risk Mitigation	0.570	0.426
Risk Control	0.540	0.391
SC Resillience	0.200	0.102
SC Robustness	0.285	0.189

5.2 Structural model analysis

Both analyzes (ie, correlation and PLS path coefficients) were used collaboratively to explain the relationship between variables. We use the bootstrap resampling method which stabilizes the estimated coefficients to calculate the error and thereby determine the significance of these coefficients. The results showed as shown in table 5, a negative and significant direct relationship between the impact of disruption and SC risk identification, SC risk assessment and SC resilience. The findings demonstrate the negative impact of COVID-19 on companies' SCRM practices and their ability to regain their performance.

Therefore, H1a, H1b and H3 are supported. In contrast, no significant direct effect of impact distribution was found on either SC resilience or SC risk mitigation and control. Therefore, H1c, H1d and H2 were rejected.

This study analyzes the role of SCRM in absorbing the impact of disturbances and building SC resilience and resilience. COVID-19 appears to be negatively affecting how companies identify and assess SC risk due to the domino effect of sudden disruption on a global scale that few companies were able to predict beforehand. The findings suggest that the COVID-19 disruption impact mainly affects SC resilience thereby creating short-term negative effects. However, SC resilience is not directly affected by the impact of disruption because most companies seem to think that they have been able (or will be able) to recover and regain their previous level of SC performance.

Resilience and resilience SC requires different combinations of resources, capabilities and processes. In the context of Covid-19, this difference can be explained by the specificity associated with SC resilience and toughness. As defined by Ivanov (2020) and Ivanov and Dolgui (2020), SC toughness can be built without structural changes, whereas SC Resilience is a disruption driven concept that requires special adaptation by the company. Thus, the findings reveal that all four SCRM practices positively affect SC resilience, whereas only SC risk identification and controls have a direct positive effect on SC resilience.

Our finding in this study that all SCRM practices positively affect SC resilience strengthens the proposition of DuHadway et al. (2019) regarding the recovery efforts needed for SC resilience. However, only SC risk identification and control had a direct positive effect on SC resilience. These results offer more nuance to the previous literature on SCRM practices (Ambulkar et al., 2015; Kern et al., 2012; Wieland and Wallenburg, 2012).

SC risk process designed; The indirect effects highlighted in our study underscore the mediating effect of SCRM practices that help firms restore SC operations, overcome disruptions and restore planned performance. Consequently, our study provides further support for the RBV and DC approach by identifying a major SCRM process that can be relied upon to enhance SC resilience and toughness as a dynamic capability.

Despite the insignificant direct effect of SC risk assessment and mitigation on SC resilience, the indirect positive effect of SCRM practices suggests that companies faced with the unprecedented threat of the current COVID-19 situation, are forced to 'improvise' new assessment measures. and risk processing. Finally, the combination of these practices contributes to the positive impact of SC risk control on SC resilience.

Table 5. PLS-SEM Structural Model

Pengujian Hipotesa	Direct	T	Indirec	T	Total	T value	Mediation Type
Impact -> Identification	-0.137	2.631			-0.137	2.631	Direct-only
Impact -> Assesment	-0.069	2.115	-0.105	2.603	-0.036	0.693	Complementary
Impact -> Mitigation	-0.068	1.899	-0.026	0.691	-0.095	1.788	No-effect
Impact -> Control	-0.061	1.763	-0.068	1.799	-0.13	2.529	No-effect
Impact -> Resillience	-0.06	1.276	-0.094	3.079	-0.154	2.833	Indirect-only
Impact -> Robustness	-0.264	5.686	-0.04	1.758	-0.303	6.652	Direct-only
Identification -> Resillience	0.3	4.13	0.041	0.735	-0.342	6.601	Direct-only
Assesment -> Resillience	0.265	3.363	0.318	6.701	0.051	0.717	Complementary
Mitigation -> Resillience	0.19	2.719	0.248	4.722	0.437	7.065	Complementary
Control -> Resillience	0.344	4.687			0.342	4.687	Direct-only
Identification -> Robustness	0.145	2.037	0.174	3.322	0.319	6.452	Complementary
Assesment -> Robustness	0.098	1.283	0.128	2.228	0.226	3.358	Indirect-only
Mitigation -> Robustness	0.049	0.587	0.128	2.22	0.177	2.252	Indirect-only
Control -> Robustness	0.177	2.278			0.177	2.278	Direct-only

5.3 Managerial implication

This study brings important lessons for global risk managers as well as supply chain managers. In particular, managers should pay attention to the importance of SCRM. It is a starting point for large groups of companies that do not work actively in SCRM and therefore ignore or fail to recognize supply chain risks, sometimes with dire consequences. Our research shows that companies can reduce the frequency of supply chain disruptions by actively working with supply chain partners. In doing this, buyers and suppliers are likely to maintain awareness of the disruption and take steps to collectively respond to real problems and perceived risks. This inter-organizational orientation to managing supply chain risk can be strengthened through the establishment of a formal risk management infrastructure. Managers should also seek to link processes and develop collaborations with supply chain partner practices such as business continuity analysis or security procedures. Our findings suggest that although the presence of internal resource structures alone does not significantly reduce the frequency with which firms experience distraction effects, they can ensure collaboration efficacy in SCRM. Based on the low percentage of companies

6. Conclusion (12 font)

Based on the observations and data analysis described in the previous chapter, conclusions can be drawn in this study which empirically tests the SCRM practice framework to strengthen the previous risk management theory in SC (Fan and Stevenson, 2018). sequential interrelationships of SCRM practices that companies might adopt to address significant disruption risks. Our finding is that there is a relationship that affects supply chain risk management in companies by strengthening risk identification in the company's SC. In general, the role in the collection and processing of information significantly affects the resilience and resilience of SC and can be very useful for companies in the COVID-19 situation and its future impacts. The combination of theoretical perspectives in uncertain SC conditions suggests that firms that master information from their SCRM can further enhance the resilience (and resilience) and performance of their SC. The companies in our subject have carried out SCRM voluntarily or developed their risk management practices because of the benefits to the company's SC performance but the priority of the companies should be to develop efficient and continuously updated measures in identifying risks as they affect other SCRM processes. The impact of COVID-19 that needs to be highlighted is the need for collaboration and sharing of resources and information between companies and also companies should try to build cooperation with other SC members to prepare for different disruption impact scenarios that cannot be mitigated by one company.

6.1 Suggestion for future research

Based on the conclusions of the research conducted, our study has several limitations that offer opportunities for further research. So the advice that can be given by the author is that this research is limited to the Automotive Manufacturing Industry in Indonesia with most of them being Japanese companies that already have many factories to face their supply chain risks. Future research may be able to investigate other contexts/subjects. This study collects data only at one time and does not have access to data with a relatively longer time. With data that has a relatively long time, it may provide better knowledge of the interactions of SCRM practices, the impact of SC disruption, SC resilience and resilience. This study focuses on the resilience and toughness of the SC in the event of a disturbance impact. Even so, future research would be better if evaluating how companies process information related to risks or company strategies to develop their resilience and resilience.

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