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The Covid-19 outbreak and Business Continuity: an Empirical Assessment amongst SME's located in Twente.

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Abstract

The rise of globalization has resulted in an increasingly complex, lengthy and global supply chain. Besides, firms rely on their supply chain to obtain a competitive advantage. Consequently, the supply chain has become more difficult to manage and not surprisingly, the supply chain is more exposed to risk. These risks can vary in nature, ranging from disruptive low probability-high impact events to non-disruptive high probability-low impact events. In the current study the focus lies on disruptive low probability-high impact events specifically the Covid-19 pandemic. In order to overcome such major supply chain disruptions, adequate response strategies and risk management tools should be implemented to create a resilient firm. Applying several regression models, this study offers theoretical and empirical evidence as to whether a flexible or procedural response strategy minimizes the operational damage caused by Covid-19. Moreover, this study provides insights on whether a business continuity plan moderates the effect of the above mentioned response strategies with regard to lessening the operational damage caused by Covid-19. Lastly, the concept of obtaining the preferred customer status was introduced to provide insights on how obtaining the preferred customer status could diminish the operational damage caused by Covid-19. In this study, the hypotheses were tested based on subjective data (Likert-based responses) and matched from a cross-section of SMEs located in Twente. Results suggest that implementing a flexible response or procedural response strategy has no significant effect on diminishing the operational damage caused by Covid-19. Furthermore, the expected moderating effect of business continuity plans on the response strategies was not detected. Finally, results derived from the analysis indicated that obtaining the preferred customer status has no significant effect on diminishing the operational caused by Covid-19.

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1. Introduction

The Covid-19 pandemic has proved to be relatively unpredictable and disastrous. The outbreak is unparalleled and has disrupted daily operations for the majority of firms around the world. If anything, the Covid-19 pandemic has taught us that studies with regard to supply chain disruption and supply chain risk management will receive more prominence than ever (Ivanov & Dolgui, 2020, p. 2904).

A pandemic outbreak can be characterized as a specific type of supply chain disruption, due to a number of factors. First, the disruption is considered to be long-term and its scaling is unpredictable. Secondly, a pandemic consists of the concomitant disruption within supply, demand and the logistical infrastructure (Ivanov, 2020, p. 2). A pandemic disruption is unique, as it tends to start small and scale rapidly, to eventually disperse over many geographic regions.

Due to the fact that a pandemic dispersion is dispersed over many regions and that the disruption affects multiple links in the supply chain, globalization has had an substantial influence. The rise of globalization has resulted in an increasingly complex, lengthy and global supply chain. Besides, firms rely on their supply chain to obtain a competitive advantage (Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006, p. 108). Consequently, the supply chain has become more difficult to manage and not surprisingly, the supply chain is more exposed to risk (Hoffmann, Schiele, & Krabbendam, 2013, p. 199). These risks can vary in nature, ranging from disruptive low probability- high impact events (H. A. Akkermans & van Wassenhove, 2013, p. 6747), which are metaphorically described as black swans (Aggarwal & Bohinc, 2012, p. 41) or supply chain tsunamis (H. Akkermans & Van Wassenhove, 2018, p. 64) to non-disruptive high probability-low impact events. Such events could have a disastrous impact on the firms its operations (Park, Hong, & Roh, 2013, p. 80). Supply chain disruptions come to pass in many forms such as terrorist attacks, natural disasters, power grid outages or labor strikes (Hale & Moberg, 2005, p. 195). The effect of such supply chain disruptions are not consistent with each disruption. The severity and frequency are the most important determinants to assess the effect of separate disruptions. In the case of a pandemic, which is viewed as a high impact- low probability event (H. A. Akkermans & van Wassenhove, 2013, p. 6747), it is expected that the effects are different due to the global and unpredictable nature of the disruption.

To illustrate the potential disastrous consequences of supply chain disruptions on product distribution, two examples will be highlighted from back to 2011, when Japan was hit by a tsunami, and 2000, when a thunderbolt struck a Philips semiconductor plant in Albuquerque, respectively. The tsunami in Japan disrupted both domestic and global supply chains. Global car manufacturers such as Ford, Volkswagen and BMW are depending on Japanese suppliers and after the tsunami, they had to place a hold on several painting colors (Schmitt, 2011, p. 1). Additionally, as a consequence of the tsunami in Japan, the sale of the 'IPAD 2' had to be delayed, because four core parts could not be delivered from Japan on time (Abe & Hoontrakul, 2012, p. 1). In a similar vein, a thunderbolt which struck a Philips semiconductor plant in Albuquerque in March 2000, caused a 10 minute fire which destroyed millions of chips. Consequently, Philipps was unable to deliver the chips towards its two largest Scandinavian clients namely Nokia and Ericsson, which had cost Ericsson 400 million dollars (Latour, 2001, p. 1).

The inability to distribute products is not the only negative consequence of a supply chain disruption. Hendricks and Singhal (2003, p. 43; 2005) studied the effects on stock market reaction as a consequence of the disruption. Results showed that firms experienced a negative

stock market as a reaction to the announcement of a supply chain disruption, as significant as a decline in market capitalization of 10%. It is relatively difficult to quantify the costs of such a supply chain disruption, and it varies from business to business. However, in a survey conducted by Rice and Caniato (2003, p. 30) one firm experienced 50 to 100 million cost impact for each day of disruption in their supply network.

More recently, firms are looking for possibilities to reduce the impact of supply chain disruptions (Azadegan & Jayaram, 2018, p. 271; Bode & Macdonald, 2017, p. 837). Business managers and scientists are much alike with regard to estimating and analyzing probabilities of exogenic events that occur in the world. The ability to shield itself against black swan events could determine whether a firm is able to stay in business, for instance, by changing current business models. Much of the ability to shield itself lies within the success rate of the performed estimations. The objective is to create a secure and resilient supply chain which is able to weather storms, (Pettit, Croxton, & Fiksel, 2013, p. 53). (Ivanov & Dolgui, 2020, p. 2905) depict that the COVID-19 outbreak illustrates that in unprecedented events, the supply chain resistance needs to be measured at the scale of survivability or viability in order to prevent supply chain destruction. Each company deals with risks differently and the differences between small medium enterprises and larger companies with regard to their approach to risks, are striking. In this study, Small Medium Enterprises (SME's) are the subject of scrutiny, because the majority of companies listed are SME's, however they are underrepresented in literature. According to FEMA (2018, p. 1), 40% of SME's will not be able to reopen after the occurrence of a natural disaster. SME's conduct business in the same arena as their bigger peers, only the difference is that those larger firms reap the associated benefits such as access to adequate capital and the ability to sway employees to be able to win the war on talent. As of recent, SMEs experience ever expanding legislation, ever increasing competitive pressures stimulated by the development of a global market, and the leniency towards trade barriers (Leopoulos, 2006, p. 225). SMEs are characterized by their adaptability and speed, such as in the vicinity to their customers, their receptiveness on the adaptation of new working methods, and most noted, their risk-tolerant attitude. However according to Albert Berry (2002, p. 14), many SMEs are prone to major external shocks. Notwithstanding, SMEs encounter difficulties with regard to overcoming these hindrances. Leopoulos (2006, p. 226) depicts that it is important that SMEs develop the abilities to tackle these risks which are presented to the organization. Findings derived from a study performed by Runyan (2006, p. 21) suggests that small business have difficulties overcoming these disruption due to a lack of planning, vulnerability to cash flow interruption and lack of access to capital for recovery. Therefore, SME managers need to place more emphasis on the importance of risk identification and minimization of operational damage or they can experience disastrous consequences if there unprepared for the result of a potential risk (Smit & Watkins, 2012, p. 6324). This implies that managers and business owners should be acquainted with risk management which entails risk identification and risk analysis in order to tackle these risks (Falkner & Hiebl, 2015, p. 2). The incorporation of risk management into SME firms, could potentially result in that SMEs are better suited to utilize their resources thereby converting risk into a positive outcome (Banham, 2005, p. 69).

One aspect of risk management which SMEs could apply more frequently is implementing information systems in order to detect those supply chain disruptions. According to Fani and Subiadi (2019, p. 1), information systems/information technology has an important role in overcoming disruptions to maintain the business continuity of the organization. It does not matter whether the organization is big or small, these supply chains disruptions need to be

dealt with appropriately by selecting an adequate response approach and deploying supply chain risk management tactics to weather these storms.

In order to be able to weather those storms, supply chain risk management tactics have to be deployed. It is obvious that there are a number of alternatives when it comes to mitigating supply chain disruptions, depending on the nature of the disruption itself. Risk mitigation strategies could be rather drastic in changing existing business models, but it can also entail to relatively minor modifications such as broaden the existing suppliers base or to provide for buffer inventory. Which supply chain risk management tactics are being deployed is partly dependable on the selected response approach. In crisis response literature, two distinctive response approaches are identified namely: flexible response approach and procedure response approach (Smith & Elliott, 2007, p. 524; Sutcliffe & Vogus, 2003, p. 97). These response approaches are generally applicable for companies, whether it is facing a major supply chain disruption or are in a crisis time, it can be applied in all situations. Due to the wide applicability of these response strategies, they were chosen to be examined in this study. According to Harrald (2006, p. 268), firms who adopt a procedural oriented response emphasis establish protocols as a cornerstone in their strategy dealing with supply chain strategies. This approach rests on the foundation that reliability and efficiency improve performance (Seifert, 2007, p. 99). Firms whom adopt a procedural response approach rely on pre-defined protocols and analyze how previous disruptions were handled. On the contrary, some firms prefer to remain flexible to be able to improvise and adapt to new development. According to Deverell and Olsson (2010, p. 12), this adaptive standpoint enables the firm to act beyond operational standards in order to tackle disruptions. This flexible position provides various advantages when it comes to tackling supply chain disruptions. A flexible position could potentially remove any obstacles in sharing information and it could reduce mutual interdependence.

Alongside response approaches, various risk management tactics/tools could be deployed such as a business continuity plan. There are eminent gaps in the literature in understanding the role of business continuity plans and response approaches in diminishing the operational damage caused by a major supply chain disruption. This study offers new insights with regard to the literature on supply chain management and in particular risk management. A business continuity plan could aid in mapping the possible risks and helps in determining an adequate strategy. Risk experts suggested that developing Business Continuity Plans (BCP) could help to recover from disruptions (Kildow, 2011, p. 57). In a study conducted by Haag, Cummings, and Mccubbrey (2001, p. 243), results show that companies that did not develop a business continuity plan, encounter significant data loss, experience a 43% chance of cessation and a 51% chance that the company will close within two years. Only 6% of companies without a business plan continuity in place survive for a long time. According to Engemann and Henderson (2014, p. 8), typically a business continuity plan includes various strategies with regard to risk mitigation, risk management, emergency response activities and continuity planning. Business continuity plans has received more prominence now than ever (Azadegan, Mellat Parast, Lucianetti, Nishant, & Blackhurst, 2020, p. 39). Supply chain disruptions are often seen as wake-up calls for firms to improve their continuity efforts. For instance, according to Wright (2013, p. 1), after the Tsunami in Japan, a significant amount of firms started the development of business continuity plans in order to mitigate supply chain disruptions. In a study conducted by Alcantara (2015, p. 300), results showed that the percentage of firms with business continuity plans in place increased from 57.7% to 72% from 2012 till 2014. The development of business continuity plans has not been the topic of scrutiny very often, however the call for future research has been

growing (Chopra & Sodhi, 2014, p. 76). A business continuity plan is a tactic as a response to a crisis.

A different strategy to deal with supply disruption risk is to obtain the preferred customer status (Huttinger, Schiele, & Veldman, 2012, p. 1204). The concept of preferred customer status in relation to risk management has not been studied frequently. In this study a new focus area has been proposed in which the effect of preferred customer status has been researched in order to study the effects of preferred customer status on operational damage caused by Covid-19. Preferred customer status has not been the subject of scrutiny frequently in conjunction with supply chain risk, however it could prove to be an useful risk mitigation strategy. If a firm obtains the preferred customer status, suppliers grant these firms preferential resource allocation, which, during a pandemic outbreak, is considered to be valuable (Schiele, Veldman, & Hüttinger, 2012, p. 1194). One can imagine that at the time of a natural disaster, receiving the last container or the last shipment could be massive. In this study, the effect of preferred customer status in combination with response approaches with regard to operational damage, will be researched. Operational risk has been selected as type of risk in this study, as it comprises business operations which are relevant to business owners. According to Verbano and Venturini (2013, p. 13), operational risk comprises business operations (e.g. human resources, product development and supply chain management, information/business reporting (e.g., budgeting and planning) and empowerment (e.g., leadership and readiness to change). It is expected that being the preferred customer aids in diminishing the operational damage caused by a supply chain disruption. In particular SME's are frequently more impacted by operational risk than their larger counterparts. Their inability to attract external capital and the lack of implementation of risk management tactics are found to be the determining factors with regard to risk management capabilities (Runyan, 2006, p. 21).

Overall it has been found that SMEs are vulnerable in the face of a crisis in comparison to their larger counterparts, as they lack the adequate access to capital. Moreover, risk management in SMEs has been relatively neglected. Appropriate risk management strategies such as developing adequate response strategies which could include obtaining the preferred customers status and the development of a business continuity plan, could lead to reducing the operational damage as a consequence of a major supply chain disruption, such as Covid-19. However the literature on preferred customer status in relation to risk management is scarce. In this study, the above-mentioned aspects will be studied in relation to each other. In a study performed by Azadegan et al. (2020, p. 57), a vignette-based factorial experiment has been applied to analyze the managerial assessment of the effectiveness of response approach on operational damage caused by disruptions. A hypothetical company named ABC was created to assess the response approach applied by managers from 132 Italian firms.

Contrasting, in this study, the managerial assessment of 60 SME owners in a real-life setting will be analyzed, with regard to the effectiveness of the response approach on operational damage caused by Covid-19. Adopting this method and specifying it on a specific practical major disruption, will add to the existing literature with insights on how manager deal with a real-life event since real-life data is influenced by many more variables than an experiment. Moreover, the influence of BCP's on the effect of the response approach with regard to a major disruption, in this case COVID-19, was researched. Additionally, this study places emphasizes on SMEs located in the Netherlands, which can offer new insights on how SMEs managers deal with such disruptions as they encounter more difficulties in accessing adequate capital and the associated benefits of extended human resources, than their larger counterparts and their

different character with regard to their risk-tolerant attitude and adaptability as opposed to that of larger firms. It is expected that because of the above-mentioned elements, SMEs will respond differently to major supply chain disruptions than their larger counterparts. In this study the theoretical and empirical demonstration of response efforts will be illustrated. The role of these approaches have been the subject of scrutiny in various crisis management and supply chain related papers (Roux-Dufort, 2007, p. 109); (Brockner & James, 2008, p. 60);(Tenhiälä & Helkiö, 2015, p. 155); (Deverell & Olsson, 2010, p. 11). Additionally, the influence of business continuity plans on harmonizing the response approach linked to operational damage caused by a major disruption was analyzed. This study contributes to the existing literature by specifying the response approaches to a practical major supply chain disruption in providing evidence of the benefits of these approaches and business continuity plans in diminishing the operational damage caused by Covid-19.

The practical contribution this study offers is that the results derived from this paper, SME business owners could gain insights with regard to the benefits derived from the response approaches, the advantages business continuity programs could offer and how the preferred customer status is a powerful remedy to deal with supply chain disruptions. It also helps to identify the weaknesses and strengths with regard to the two different response approaches; procedural and flexible. Eventually, with these new insights the next time a major supply chain disruption presents itself, managers and business owners are better informed in order to minimize the operational damage caused by that same major supply chain disruption.

Concluding, the operational damage caused by Covid-19 on firms located in Twente was researched. The central research question in this study is: *To what extent does either a flexible response/ procedural response strategy or obtaining the preferred customer status reduces the operational damage caused by Covid-19 and what is the moderating effect of business continuity plans on the application of the response strategies.*

The remainder of this paper is structured as followed. This paper starts off with a literature review focusing on supply chain disruptions and the adequate risk management strategies which could diminish the impact of those supply chain disruptions. Complementarily, the conjunction of response approaches and business continuity plans with regard to supply chain disruptions are conceptualized. Subsequently, an elaboration follows on the development of the hypotheses with regard to how firms apply a procedural or flexible approach to deal with supply chain disruptions and what effect business continuity plans have on relationship. This paper then follows suit by explaining the methodology being applied in this study, the data collection method and analyzing techniques are described. Next, the results from the survey are shared. Then, in the discussion section this paper tenders the practical and theoretical repercussions with regard to risk management and business continuity plan research. In the conclusion section, the hypotheses and the central research question are answered. Lastly, recommendations are provided for future research.

2.Theoretical framework

2.1 SME review

Not every company deals with supply chain disruptions in a similar manner. Significant differences could be detected between companies. Especially between small-medium enterprises and large companies, supply chain disruptions are tackled differently.

2.1.1 SME definition

Small-Medium business can take various forms and shapes. There are three criteria that need to be taken into account to determine whether a firm is considered to be an SME or not. Thresholds are considered to analyze the three criteria. According to Commission (2015, p. 3), a firm is considered to be a micro-enterprise when they employ fewer than 10 persons and whose annual turnover does not exceed 2 million euros. A firm is defined as a small enterprise when it employs fewer than 50 persons and whose annual turnover does not exceed 10 million. Lastly, firms who are considered to medium sized employ fewer than 250 persons and whose turnover does not exceed 50 million. Nevertheless, turnover and firm size are not the only factors that should be taken into account.

SME require assistance that other enterprises do not. SMEs experience an unique set of issues. SMEs often experience market failures which makes the market in which they compete more difficult. Moreover, SMEs have limited access to capital or they could lack the resources to comply with environmental regulations. Additionally, SMEs must also overcome structural barriers such as the lack of managerial and technical skills and limited knowledge of opportunities to expand internationally (Commission, 2015, p. 4). Curran and Blackburn (2001, p. 14) depict that the definition of SMEs based on the number of employees has become difficult to hold onto, as part-time work, casual work, work on demand, or temporary work has becoming more popular.

Nevertheless, the lack of a clear up-to date definition has resulted in excessive variability with regard to the normative aspects of SME policies. These difficulties could potentially create normative biases as a result of blurry definition of SMEs. However, since there are so many definitions to find and they are so different from each other depending on where one would find him/herself geographically, an overview has been created, see table 1. Some definitions are shortly discussed below.

In the UK, a widely accepted definition is derived from the findings of the Bolton (1971) committee report which defines SMEs as an independent business, managed by its owner where such firms have a small market share (Gilmore, McAuley, Gallagher, Massiera, & Gamble, 2013, p. 89). Hill (2001, p. 177), argued that difficulty arises when one would adopt this definition, because it is not always suitable as they can be influenced by regional variations. In the United States, SMEs are defined as being an independent business having fewer than 500 employees. Concluding, there is no uniform definition of SMEs which is internationally accepted (Gilmore et al., 2013, p. 89).

Since this study has been undertaken in the Netherlands it seems only right to apply the MKB (SME) definition which is formulated by the European commission and adopted in the Netherlands namely: *"Small enterprises are defined as enterprises which employ fewer than 50 persons and whose annual turnover or annual balance sheet total does not exceed 10 million*

euro" (Verheugen, 2005, p. 14). Applying this relatively generic definition grants to include as many firms as possible in this study which enhances the power in the study, which allows for being able to detect differences between groups better. Additionally, 99% of all business in the Netherlands are classified as SMEs (mkbservicedesk, 2019, p. 1). Overall, most authors conclude that the definition of SMEs should be derived from size and turnover as determining factors.

Table 1. SME definitions

Number	Author(s)	Definition
1	Gilmore et al. (2013, p. 89)	A small firm is defined as an independent business, managed by its owner or part-owners and having a small market share
2	SBA (2008, p. 1)	In the Small Business Administration uses the term "size standards" to define small businesses. - 500 employees for most manufacturing and mining industries -100 employees for wholesale trade industries - $6 million of annual receipts for most retail and service industries.
3	Verheugen (2005, p. 14)	Small enterprises are defined as enterprises which employ fewer than 50 persons and whose annual turnover or annual balance sheet total does not exceed 10 million euro
4	Kim and Vonortas (2014, p. 455)	SMEs are newly established (2–8 years old) independent small businesses(under 49 employees)
5	Companies-Act (2006)	In the UK, SME are defined as companies whom have a turnover of not more than

		£5.6 million, a balance sheet total of not more than £2.8 million and not more than 50 employees.
6	Ayyagari, Demirgüç-Kunt, and Beck (2003, p. 4)	Medium enterprises are defined as enterprises which have at most 300 employees and an annual turnover not exceeding 15 million US dollars. Furthermore, small enterprises have fewer than 50 staff members and up to 3 million US dollars turnover

2.1.2 Differences between SMEs and Large Firms

An overview is created for the differences between SMEs and large firms, see table 2. All those differences are discussed hereafter.

Firstly, smaller firms engage less frequently in formal/informal training activities than larger firms, experience higher rates of 'churn' (new entrants and early exits) and can ill afford to release precious staff for development activities because of time and skills pressures related to their small size (Noble, 1997, p. 9).

Furthermore, there is desire for personal independence, a frequently mentioned career-choice motive, as stated by small firm owners (Hakim, 1988, p. 422). This effect was found particularly in SMEs, and could have an effect on inhibiting collaboration with other firms, it could hamper the effective use of external support and it could hamper the efficient delegation of responsibilities.

Additionally, the resource constraints and access to capital of smaller firms implies that strategic choices are limited and formal strategies/training and development practices are sparse (Curran, Blackburn, Kitching, & North, 1996, p. 67). As outlined by Rivaud-Danset, Dubocage, and Salais (2001, p. 5), the main stream of finance for SMEs is debt. Only a small portion are present in the equity market. Traditionally, SMEs have to deal with a series of obstacles in their quest to obtain external financing, in comparison to larger firms. The primary reason why, is that SMEs have a higher risk of failure.

Moreover, in a study conducted by Gray and Mabey (2005, p. 479), findings showed that small firms are far less likely to commit to written policies, are significantly less likely to align their management development to longer term strategy, but are more likely to be driven by practical results such as customer satisfaction and staff retention.

Furthermore, SMEs are found to be different with regard in their use to open innovation practices than their larger counterparts. SMEs tend have less formalized internal R&D procedures and a different set of network characteristics than large firms. They are also more prone to risks associated with open innovation than large companies, such as relying significantly on outside parties. Moreover, the lack of resources in SMEs to be able to look

outward is found to be an obstacle to open innovation, but simultaneously it is the main motive of SMEs to look further than their organizational boundaries for obtain required knowledge and technological ideas (Spithoven, Vanhaverbeke, & Roijakkers, 2013, p. 555).

Regarding profitability, in a study conducted by Rivaud-Danset et al. (2001, p. 19), results showed that SMEs were found to employ capital more effectively and showed a higher degree of product transformation in comparison to larger enterprises.

Moreover, Cooper, Willard, and Woo (1986, p. 248) stated that the majority of SMEs may not compete directly against their larger counterparts because of their limited resources. Instead, SMEs prioritize protecting their specialized niche market by generating sufficient profits not dependable on the size or market share (Lambert & Cooper, 2000, p. 78).

Lastly, the internal control structure has been found to be a determinant which distinguishes SMEs from their larger peers. A large portion of large firms apply a decentralized form of control structure. These are characterized by being highly specialized with multiple competencies, whilst SMEs are specialized with one specific core competency. Another difference is that SMEs are more inclined to focus on their organizational-decision making and information flows, whilst larger firms tend to incorporate more autonomy in their internal operations. Additionally, SMEs are more inclined to centralize their key strategic operations in comparison to larger firms (Archer, Hong, & Jeong, 2006, p. 294).

To summarize, it was found that SMEs differ from their larger counterparts in a number of ways. First, the resource constrains SMEs facing is a significant difference in comparison to large firms. Furthermore, the urge for personal interdependence of small business owners and a more decentralized form of control structure are found to other important distinctive features of SMEs. Apart from all these differences, is that risk management within SMEs is also found to be significantly different compared to larger firms.

The emphasis in this study lies on SMEs, because SMEs are more vulnerable to supply chain disruptions, concerning the above-mentioned differences.

Table 2. Differences between SMEs and Large Firms

Number	Author(s)	Difference
1	Noble (1997, p. 9)	Frequence of training
2	Hakim (1988, p. 422)	Desire for personal indepedence
3	Curran et al. (1996, p. 67); Rivaud-Danset et al. (2001, p. 5)	Resource constraints/Access to capital
4	Gray and Mabey (2005, p. 479)	Management Development
5	Spithoven et al. (2013, p. 555)	Positioning towards Innovation

6	Rivaud-Danset et al. (2001, p. 19)	Profitability
7	Cooper et al. (1986, p. 248); Lambert and Cooper (2000, p. 78)	Competitive priorities
8	Archer et al. (2006, p. 294)	Internal control structure

2.1.3 SME Risk Review

The development, research and discussion of supply chain risk management has to date predominantly focused on the larger organization as opposed to the Small and Medium sized enterprise. However, in most developed and developing countries, the majority of employment comes from Small and Medium Sized enterprises (Jüttner & Ziegenbein, 2009, p. 9). SME owners are well acquainted with their firms, but most often they are unable to harness the information impacting their operational activities. According to Kesper (2001, p. 181), SME owners tend to underrate the significance of external factors but overrate internal weaknesses.

Obstacles experienced by SMEs can be classified into two categories: economically rooted obstacles and enterprises based obstacles (Dockel & Ligthelm, 2002, pp. 1-2). Firstly, the success SMEs strive for is dependent on the local economic conditions. The sectors growth in which SMEs operate is tied at the same rate as the macro economy as a whole. If the economy is in a downturn, SMEs will experience difficulties as well (Ishwarlall Naicker, 2006, p. 10). Moreover, enterprise rooted obstacles can be described as human resource problems including poor staff planning, lack of training, low productivity levels and difficulties in attracting talented staff members (Rogerson, 2001, p. 283). As concluded by Al Berry et al. (2002, p. 94), labor markets and skill levels of the workforce are the most important contributing aspects to SME growth.

Risk management is a significant bottleneck for all companies, no matter the size. However, small and medium sized firms are in particular sensitive to business risk (Blanc Alquier & Lagasse Tignol, 2006, p. 273). Watt (2007, p. 122) argued that the risk management task within SMEs usually rests with the owners evaluation of risks and opportunities applicable to the firm. That being said, although risk management principles are a common concept to all kinds of firms, the owner risks evaluation and his/her attitude towards risk management influences the effectiveness of deployed risk management strategies. Inevitably, entrepreneurs who found SME are focused on recognizing future uncertainty, assessing risks and possible consequences and effects. One of the core abilities which entrepreneurs need to possess is the identification of risks. Applying risk management models could help managers to develop a better understanding of the risk their firms are facing.

Jüttner and Ziegenbein (2009, pp. 211-215) attempted to close the research gap on risk management in SME by presenting a practical three-step supply chain risk management approach. In Phase 1 the identification of supply chain risks are central, in which supply chain mapping and the defining the supply chain for analysis are being applied. In the second phase, the model moves on the assessment of supply chain risks where the assessment of supply chain

risks and mitigation measures are being evaluated. Lastly, in phase 3 the actual supply risk mitigation strategy will be formulated and mitigation actions will be compared and assessed.

Faisal, Banwet, and Shankar (2007, p. 591) studied the topic of supply chain risk management in SMEs in order to detect obstacles to risk management and to comprehend their mutual relationships. Thun, Drüke, and Hoenig (2011, p. 5520) tested several hypothesis such as whether small and medium enterprises regard their supply chain as more vulnerable than large-scale enterprises. Their analysis showed that small and medium firms do not regard their supply as less vulnerable against supply chain risks. Moreover, in their second formulated hypothesis small and medium firms were analyzed whether those firms are affected more strongly by development towards and efficiency of supply chains than their larger counterparts. The results derived from their analysis show that no significant differences exists between SME and larger firms with regard to the key-drives of supply chain risks. The third hypothesis examined whether SMEs implement instruments of supply chain risk to a lesser extent than their larger counterparts. Results showed no significant differences between the usage of instruments between small and medium firms and large firms. However, their last hypothesis examined whether SMEs focuses more on reactive instruments rather than preventive instruments. Results showed that SMEs placed more emphasis on reactive instruments such as overcapacity rather than on preventive instruments such as on-time deliveries which is preferred by larger firms.

To conclude, risks evaluation within SMEs is derived from the owner his/her attitude towards risk management which could influence the effectiveness of deployed risk management strategies. Inevitably, entrepreneurs who found SMEs are focused on recognizing future uncertainty, assessing risks and possible consequences and effects. Applying risk management models could help managers to develop a better understanding of the risk their firms are facing. The concept of risk has been richly studied and many definitions come to pass during the long history of risk.

2.2 Risk review

2.2.1 History and definition of risk

Bannister and Bawcutt (1981, p. 20) depict in their study that risk encompasses *"The identification, measurement and economic control of risks that threaten the assets and earnings of a business or other enterprise".* The study of risk management began shortly after WW2. In the 50's, market insurances were viewed as expensive and ineffective in mitigating risk. Various types of risk management arose to compensate for these market insurances. In the 70's the application of risk management instruments received more prominence as firms enhanced their financial risk management. In the 80's the rise of international risk regulation has resulted in that firms developed internal risk management models and formulas to calculate capital in order to hedge against unanticipated risk and to reduce regulatory capital (Dionne, 2013, p. 148)

As outlined, plentiful definitions or risk exists which can then be divided into types and classes. The common denominator concerning the definitions in table 3, is that risk entails uncertainty and most importantly could potentially result in an undesired consequence. The difference lies in the individual perception of risk and the level of where the risk takes place.

In this study, the definition of Bannister and Bawcutt (1981, p. 20) *"The identification, measurement and economic control of risks that threaten the assets and earnings of a business or other enterprise" ,* will be applied as it entails the identification, measurement of substantial

risks which can threaten an enterprise, which is in alignment with the purpose of this study. The study of risk management dates back all the way to WW2 and has developed from the application of market insurances into the development of comprehensive risk management modules and formulas to detect disturbances. Nonetheless, many definitions of risks exists, but risk is also found to come in many types.

Table 3. Definitions of Risk

Nr	Author(s)	Definition
1	Bannister and Bawcutt (1981, p. 20)	Risk entails the identification, measurement and economic control of risks that threaten the assets and earnings of a business or other enterprise
2	Mitchell (1999, p. 165)	Risk is frequently perceived as the reflection of variation in the distribution of possible outcomes, their likelihoods and their subjective values.
3	Harland, Brenchley, and Walker (2003, p. 52)	Risk could be generally defined as the chance of danger, damage, loss, injury or any other undesired consequences
4	Norrman and Jansson (2004, p. 436)	Risk is the possibility, in quantitative terms, of a specified hazard occurrence
5	Spekman and Davis (2004, p. 416)	Risk is defined as the probability of variance in an expected outcome.
6	Sinha, Whitman, and Malzahn (2004, p. 155)	Risk can be defined a function of the level of uncertainty and the impact of an event.
7	Yang and Qiu (2005, p. 794)	Risk is viewed as a subjective perception linked to the individual's preference; risk is a relative concept and refers to the likelihood of a probabilistic event.
8	Aven, Vinnem, and Wiencke (2007, p. 434)	Risk is defined as the combination of two generic dimensions namely: possible consequences and associated uncertainties.
9	Fan and Stevenson (2018, p. 215)	Risk is an event which is rarely an isolated incident; there are often inter-relationships with other risks.

2.2.2 Supply chain risk

In this study, supply chain risk has been selected as relevant risk type as disturbances impacting the operational operations of a firm is the subject of scrutiny. Operational risk is a component of supply chain risk (Lam, 2014, pp. 128-140). Supply chain risk is viewed as operational risk for which the first step is risk identification, in order to reduce operational risk (Kilgore, 2003, p. 5).

Supply chain risk is often the result of a supply chain disruption. Supply chain disruptions can come from any source. The risk sources in the supply chain can be categorized into three dimensions: Environmental risk sources such as Acts of Gods, Terrorists attack or fuel protests; Organizational risk sources such as labor strikes or machine failures; and Network related risk sources which can come from the interactions between firms within the supply chain (Jüttner, Peck, & Christopher, 2003, pp. 201-202). Results derived from a SEC report on what the impact is of supply chain disruptions concluded that firms experienced an average of 25 % share price reduction (Conrad & Walker, 2013, p. 1). Not only that, firms could potentially experience decreased sales and brand damage while simultaneously incurring additional costs as a consequence of a business discontinuity. Conrad and Walker (2013, p. 1) stated that firms suffer a loss of 9% in sales and incur 11% higher costs on average. If the disruptions extends over a longer period, countless firms will be unable to bounce back. Business owners and managers should be concerned about these detrimental impacts, consequently the identification of supply chain risk should be considered a core activity. It presents the manager with an opportunity to get better acquainted with risk and it offers insights on how to improve the management of supply chain risks (Lin & Zhou, 2011, p. 142). The investments made on risk are not always broadly supported within a firm as it is not directly linked to pay-off, it makes it therefore difficult to advocate for these mitigation proposals (Rajagopal, Prasanna Venkatesan, & Goh, 2017, p. 669). In order to address the issue where no individual gets credit for tackling problems that never may have occurred (Repenning & Sterman, 2002, p. 64) and to stimulate supply chain risk management, the relationship between the chosen measures and the effect on business performance needs to be studied which is echoed by (Colicchia & Strozzi, 2012, p. 413).

2.2.3 Operational Risk

In this study, operational risk was analyzed as dependent variable because operational risk threatens the existence of firms and is arguably the most important risk to consider as SME owner. As outlined in the previous section, operational risk is a component of supply chain risk. A widely accepted definition of risk has been proposed by BCBS (2001, p. 2): "*the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events*" According to Verbano and Venturini (2013, p. 13), operational risk comprises business operations (e.g. human resources, product development and supply chain management, information/business reporting (e.g., budgeting and planning) and empowerment (e.g., leadership and readiness to change).

Operational risk comprises events with varying frequencies and possible patterns of occurrence and severities. Muermann and Oktem (2002, pp. 2-4) categorized operational risks into two distinctive regions: Low frequency – high severity and high frequency – low severity. According to the authors, low frequency- high severity events include the "most famous incidents" which have a major impact not only with regard to the firms its operations but also on their existence. The downfall of these low frequency events is that they usually have very few data points. The estimations and scenario plotting are based on the statistical outcomes and probabilities of these events which could be regarded as unreliable. The other region include high frequency – low severity risks which occur frequently and cause relatively small losses such as accounting irregularities. The upside of high frequency-low severity risks is that there is a possibility to create large databases to draw statistical analysis from. These estimations could be used to estimate the loss distribution. Moreover, high-frequency-high severity events are also quite common in the manufacturing industry. According to H. A. Akkermans and van Wassenhove (2013, p. 6749), demand shocks are cyclical and comes in waves that when there is a massive drop in demand it leaves the firm with unsold inventory and production capacity unutilized. The opposite of high frequency-high severity disruptions are low frequency – low severity disruptions. These disruptions are characterized by its irregular pattern of occurrence and its low damaging effect to the firm. An example would be the breakdown of a machine which is viewed as an internal supply chain disruption. The breakdown of machinery would not occur very often, but when it does the damages are to be overseen and relatively easily analyzed.

2.2.4 Risk management strategies

Risk managers could choose from a large set of management methods to deal with operational risk. Those methods include hedging, operational loss reduction and insurance (Muermann & Oktem, 2002, p. 7). Hedging offers an opportunity to reduce operational risk. The presence of a financial derivative which value is relies on the exposure of a firm is important in order to reduce the overall risk exposure through hedging. Operational loss prevention focuses on reducing the frequency and severity of events which has led to the occurrence of operational losses. Examples of such measures are; implementation of penalties/rewards system and internal auditing. Arguably, the most common measure of insurance is capital allocation against operational losses as means of self-insurance. The suitability of the capital amount to be distributed depends on the validity of the risk measure and the mapping between the loss distribution and capital amount. As concluded by Muermann and Oktem (2002, p. 8), risk prevention and risk reduction measures are found to be most appropriate to reduce operational risk. Nevertheless, Ravindran and Warsing Jr (2012, p. 373), summarized the most practical risk management strategies as follows:

Table 4   Summary of practical risk management strategies identified by Ravindran and Warsing Jr (2012, p. 373).

| Step	Action	Description	Strategy
1	"Take the risk"	The firms owns the risk and takes actions to tackle it.	Increasing inventory.
2	"Share the risk"	Share risk with partners	Apply portfolio strategy.
3	"Transfer the risk"	Make suppliers to bear all the risk	Change contract determinations
4	"Reduce the risk"	Take action to minimize risk.	Selecting multiple suppliers in different geographic regions to reduce the risk.
5	"Eliminate the risk"	The firm attempts to the eliminate the entire risk	Terminate partnerships or find alternatives for raw materials.
6	"Risk monitoring"	Monitoring and anticipation of risk.	Real-time monitoring of suppliers' performance to account for potential obstacles.

2.2.5 Risk Assessment

Islam and Tedford (2012, p. 4) found in their study that SMEs do not tend to formally assess and tackle operational risks, instead SMEs respond reactively through applying risk avoidance and risk transfer techniques. Risk assessment is a component of risk management which has been outlined in the previous section. Within risk management, risk assessment focuses on the analysis with regard to classifying the severity and impact of the particular risk. As outlined by Wu and Olson (2009, pp. 367-368), there are several tools available in the market such as business scorecards to evaluate the risk management level within SMEs. Business scorecards offer the flexibility to include any type of measure to account for operations, planning for any type of organization. Two common tools in identifying risks are taxonomy and risk checklist (Chapman, 2011, p. 164). A risk checklist are the creation of managers their in-house experience

from previous projects. On the other hand, the risk taxonomy offers a structure to classify the checklist of known enterprise risks into classes. The classes are risks derived from the firm its business environment and internal processes (Adhitya, Srinivasan, & Karimi, 2009, p. 1449). These classes can then be further distinguished into operational, financial and technological risk. The risk identification process is executed by analyzing each item in the checklists and taxonomies to then evaluate their applicability and relevance with regard to the current situation. These methods are praised for its flexibility which makes them so versatile for various circumstances. On the contrary, a drawback with regard to this method is that it is nonsystematic and ad-hoc. Additionally, this method lacks the capability to comprehend the complexity of supply chain risk which could lead to blind spots. A different way of tackling supply chain risk is to become the preferred customer (Reichenbachs, Schiele, & Hoffmann, 2017, p. 352). Preferred customer status gives the buyer preferential resource allocation and benevolent pricing. There are numerous measures to comprehend the threats supply chain risk can bring to the company. One measure is to analyze profit flow in the value chain in order to search for the biggest bottlenecks (Geunes & Pardalos, 2006, p. 4). Moreover, firms could also perform a supply chain risk assessment with regard to their key suppliers to identify weak links (Blackhurst, Scheibe, & Johnson, 2008, pp. 161-162). As outlined by Neureuther (2009, p. 189), the most common risk mitigating strategies are well known such as risk pooling with inventory, customer-supplier relationship management, strategic placement of warehouses and the development of adequate contracts.

However, according to the author there is a need to research new methods in mitigating supply chain risk. In order to mitigate various types of risk, several risk management models have been developed by researchers. Tah and Carr (2001, p. 838), highlighted the hierarchical risk breakdown structure model (HRBS). This model is most suitable to apply when risk has to be allocated within a project. The aim behind the hierarchical risk breakdown model is to break down project risk into internal and external risk. Internal risks are characterized by risks which firms are able to control such as conditions of contracts, whereas external risks such as the coronavirus, are considered to be more uncontrollable. A different risk management model was developed by Dorofee, Walker, Alberts, Higuera, and Murphy (1996, p. 4). In their study the continuous risk management model (CRM) has been developed, this model could be described as a software engineering practices where risk are managed with the aid of processes, methods and tools. These risks are analyzed on a continuous bases and are then being used in the decision-making phases in a project. At last, the stage gate model has been researched in a study by Bowers and Khorakian (2014, p. 27). In this model, R&D risks are managed by emphasizing the use of resources in order to ensure they are appropriately allocated based on their potential with regard to effective research results. The above mentioned models are generic risk management models, however over time more specific risk management models were developed. For example, in a study conducted by Hopp and Yin (2006, p. 19), a nonlinear mixed integer programming formula in order has been applied in order to analyze the supply chain disruption caused by a catastrophic disaster. The aim of this study is to minimize inventory and protection costs. According to Kırılmaz and Erol (2017, p. 56), risk analysis could be distinguished into five stages which are: risk identification, risk measurement, risk evaluation, risk mitigation and risk monitoring and control. This risk mitigation program is unique because the risk is quantified in the model not solely focused on the costs, but to view it as profile value. The aim is to transfer product strategy (Kırılmaz & Erol, 2017, p. 64). In a study performed by Christopher and Peck (2004, p. 16) four design principles on to develop a resilient supply chain were identified

namely: supply chain (re) engineering, supply chain collaboration, agility and developing a supply chain risk management culture, see figure 1. These principles could be applied by SME owners so that in times of a crisis, a resilient supply chain can be created. However, these principles are not the primary research objective, nevertheless it is relevant information with regard to the aftermath of such crises.
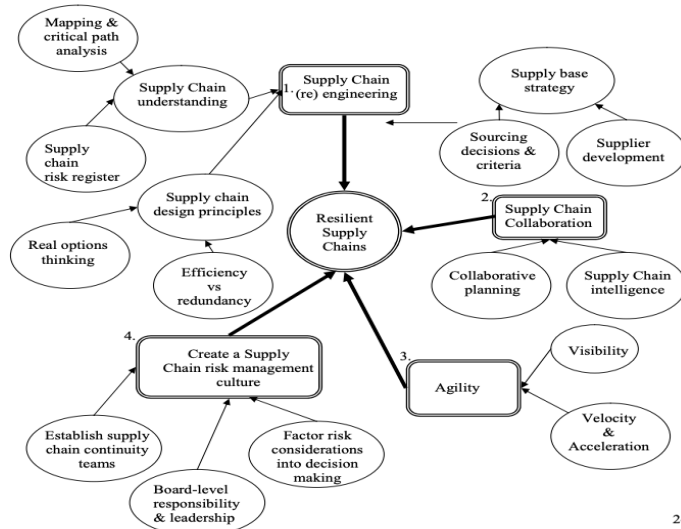
Figure 1. Four design principles on how to develop a resilient supply chain model (Christopher & Peck, 2004, p. 24)

2.2.6 Determinants of risk exposure and vulnerability

In this chapter, several general determinants of risk exposure will be outlined. These generic influence factors will be then outlined in relation to SMEs. This overview is not exhaustive, but meant for purpose to provide an overview on the most relevant factors with regard to this study. Sinha et al. (2004, p. 155) argues that lack of trust is a major factor in contribution got supply chain risk. If partners do not trust each other, they are less inclined to share information. Therefore, Sahay (2003, p. 556) suggest to in order to reduce mistrust in collaborations, managers must continuously attempt to point out the advantages which results from establishing trust between parties.

Another common factor influencing risk management is unwillingness to share risks (Lambert & Cooper, 2000, p. 78; Mentzer et al., 2001, p. 8). Applying this generic risk to SMEs, it is important for SMEs to obtain commitment for their larger partners to share risks, as they are susceptible for risks.

As argued by Leopoulos (2006, p. 225) and Runyan (2006, p. 21), their smaller size and lack of resources would not aid the cause. In order to detect supply chain risk exposures, firms must not only identify direct risks to its operations, but also the potential of sources being present at each link in the supply chain.

Hallikas, Karvonen, Pulkkinen, Virolainen, and Tuominen (2004, p. 57) states that an improved understanding of risks in a supply chain aids in making better decisions and the decreases the risks as a whole in the network. Moreover, risks never materializes which makes it

difficult to justify the prioritized time assigned on risk management and developing contingency plans (Zsidisin, Panelli, & Upton, 2000, p. 196).

Shore and Venkatachalam (2003, p. 808), found in their study that information-enriched firms in the supply chain performed better. Echoed by Chopra and Sodhi (2004, p. 54), inaccurate forecasts can be a consequence of information distortion in the supply chain.

Supplementary, agility is found to be a factor influencing risk management. The lack of agility hampers to opportunity to adapt quickly to the changing market requirements. Naylor, Naim, and Berry (1999, p. 108), define agility as the means of using market knowledge to take advantage of profitable opportunities in a risky environment. Specifying this common risk on SMEs, led us to believe that the majority of SMEs do not realize that supply chains are often facing near-permanent changes in markets. If SMEs are unable to develop capabilities to quickly adapt to changing demands, it would make it very difficult to manage risks effectively (Lee, 2004, p. 1).

A tool to assess risk is the loss assessment metric, it is found that similar tools are not being used frequently by SMEs (Morgan, 2006, p. 11). Metrics are not only important for the assistance of proposing new initiatives but it also aid in justifying existing services. A metrics misalignment is viewed as a primary source of disruption in supply chain interactions (Morgan, 2006, p. 11).

Misaligned incentives is also considered to be an influence factor of risk management. Harland et al. (2003, p. 55) conclude that the success of supply networks is dependent on the long-term commitment of their partners and their ability to share and prevent risks. SMEs are exposed to risk due to the misaligned incentives as they attempt to maximize their returns without substantial regard for their partners in the supply chain (Narayanan & Raman, 2004).

Lastly, the ability to attract talent has been found to be an important influence factor with regard to risk management. It has been found that SMES encounter more difficulties in attracting skilled employees than their larger counterparts (Kim & Vonortas, 2014, p. 454). Swaying talents in times supply chain disruptions could prove to be detrimental, as they could develop effective risk mitigation strategies to shield the firms against potential disruptions (Tung, Worm, & Peterson, 2008, p. 12).

Table 5. Determinants of risk exposure and vulnerability

Number	Author(s)	Influence Factors
1	Sahay (2003, p. 556); Sinha et al. (2004, p. 155)	Lack of Trust
2	Lambert and Cooper (2000, p. 78); Mentzer et al. (2001, p. 8)	Unwillingness to share risks
3	Leopoulos (2006, p. 225); Runyan (2006, p. 21)	Access to capital
4	Hallikas et al. (2004, p. 57); Zsidisin et al. (2000, p. 196)	Low priority & Lack of Knowlegde

5	Chopra and Sodhi (2004, p. 54); Shore and Venkatachalam (2003, p. 808)	Distortion of information
6	Lee (2004, p. 1); Naylor et al. (1999, p. 108)	Agility
7	Morgan (2006, p. 11)	Lack of loss assessment matrics
8	Harland et al. (2003, p. 55); Narayanan and Raman (2004, p. 3)	Misaligned incentives
9	Kim and Vonortas (2014, p. 454); Tung et al. (2008, p. 12)	Ability to attract talent

2.3 Response strategies

Flexible and procedural response strategies have been selected for this study for a number of reasons. Firstly, as these response approaches are generally applicable for companies, whether it is facing a major supply chain disruption or are in a crisis time, it can be applied in all situations. Secondly, these response strategies have a wide applicability. Lastly, they are pole opposites which makes it interesting to compare the contrast of certain elements.

2.3.1 History and definition

At a time of a crisis, an adequate response strategy could have a significant impact on the existence of your firm. Therefore, response strategies has been selected as subject of scrutiny as it could make a difference in whether SME firms could overcome crises. Over the past 30 years, research in organizational resilience has increased. Various studies has focused on the adaptability of firms at the time of a crisis. Results derived from a longitudinal study of minicomputer firms performed by Virany, Tushman, and Romanelli (1992, p. 72) showed that organizations which faced periods of turbulence and uncertainty performed better when they initiated substantively new patters of activity while maintaining links with established organizational competencies. On the other hand, organizational resilience is dependent on the ability to revive efficacy (Sutcliffe & Vogus, 2003, p. 105). It is more like that efficacy will be restored faster in organizations that develop through norms, structures and existing practices (Schulman, 1993, p. 360).

Sutcliffe and Vogus (2003, p. 98) stated that the consequences of risks and the application of disruption practices are dependent upon the firms response strategy. The aim is that with application of a particular response the firm strengthens their resilience in case of a

crisis situation. Viewing resilience as adaptability has starting to receive more attention (Eisenhardt & Martin, 2000, p. 1105). In order to be resilient, one has to be prepared for adversity, which requires the improved capability in investigating, learning and to act without knowing beforehand how a firm will act upon (Sutcliffe & Vogus, 2003, p. 97).

2.3.2 Differences between response strategies

Literature on the reaction towards crises indicates that firms deal with disruptions in two different ways (Seifert, 2007, p. 89). First, certain firms are focused towards flexibility, where the emphasis lies on improvisation and adaptation. According to Deverell and Olsson (2010, p. 12), this adaptive standpoint enables the firm to act beyond operational standards in order to tackle disruptions. This flexible position provides for various advantages when it comes to tackling supply chain disruptions. A flexible position could potentially remove any obstacles in sharing information and it could reduce mutual interdependence. The adaptive aspect of flexible response orientation enables firms to relatively promptly modify response strategies to modify the firm its recovery efforts (Webb & Chevreau, 2006, p. 68). A flexible position aids in tackling the consequences of a disruption by accelerating the development of improvised approaches. Additionally, the second approach is focused on procedures and well-defined responsibilities. According to Harrald (2006, p. 268), firms who adopt a procedural oriented response emphasis establish protocols as a cornerstone in their strategy dealing with supply chain risks. This approach rests on the foundation that reliability and efficiency improve performance (Seifert, 2007, p. 99). Firms which adopt a procedural response approach rely on pre-defined protocols and analyze how previous disruptions were handled. As outlined by Sine, Mitsuhashi, and Kirsch (2006, p. 122), the costs of coordination could be lowered because of a procedural stance. It can also reduce ambiguity and improve efficiency (McEntire, 2015, p. 317). The two above-mentioned response strategies are not mutually exclusive and can be used a hybrid strategy. Arguably, applying a hybrid strategy would compensate for the downfalls of each separate strategy (e.g. best of both worlds).

In conclusion, adopting a procedural response approach aids in improving the efficiency and reliability if a firm faces a major supply chain disruption such as the COVID-19 pandemic. In order to be able to effectively apply a response strategy, a detailed contingency plan could aid in alleviating the effect of a supply chain disruption.

2.4 Contingency Plans

Business continuity plans includes the assemblance of risk mitigation, risk management, continuity planning and emergency response activities (Cerullo & Cerullo, 2004, p. 71). Risk management and mitigation are more focused towards preparing a firm in anticipation of a disruptive event, whereas continuity planning and emergency response activities are focuses towards alleviating the consequences supply chain disruption.

Present day, firms are facing various types of disruptions with each disruption having its own characteristics and consequences on organizational resources. Arguably, the most comprehensive supply risk management tool for firms to apply is developing a detailed contingency plan. (Whitman & Mattord, 2011, p. 231) conclude that a contingency plan typically

includes a business impact assessment, an incident response planning, disaster recovery planning and business continuity planning. A contingency plan is developed by a firm so that it can react and recover to disruptions. A business impact analysis can be defined as the investigation and evaluation of the impact of major disruptions (Whitman & Mattord, 2011, p. 233).

Wunnava (2011, p. 11) posited in her dissertation that there are two main contingency plans, namely Business Continuity Planning and Disaster Recovery Planning. These contingency plans are executed in different time frames within firms. The rationale behind developing a business continuity plan is to strive for resuming key business operations at a minimum acceptable pre-defined level (Minimum Business Continuity Objective) following a major supply chain disruption within a so-called Maximum Tolerable Period of Disruption. On the contrary, disaster recovery planning has the objective to aim for full recovery of all disrupted operations to the firms its normal operations at a post-disaster moment in time (Sahebjamnia, Torabi, & Mansouri, 2015, p. 261). Buchanan (2002, p. 114) outlines that the primary objective of disaster recovery planning aims to identify post-disaster requirement versus how to prevent the major supply disruption to occur in the first place. An incident response plan can be viewed as the document in which all actions that a firm could take during a disruption, defined.

To illustrate the differences between incident recovery planning, disaster recovery planning and business continuity plans it can be stated that at the time of a disruption, the disruption is detected and an incident recovering plan is set in motion. If the disruption is considered to be incidental, the incident recovering plan is continued. However, if the disruption could be classified as disastrous, the disaster recovery plan is set into motion. Lastly, if the disruption is not focused on the dealing with the actual impact of an event such as an hurricane or power outage, then a business continuity plan is more suitable as it is a more comprehensive framework.

The life cycle of disaster management consists of two distinctive phases namely the pre-disaster phase and the post-disaster phase (Tufekci & Wallace, 1998, p. 104). In the pre-disaster phase, risk managers have shifted their focus from short-term recovery towards placing more emphasis on the continuity of the firm. As stated by Labadie (2008, p. 584) in this phase, organizational resilience is prioritized. Organizational resilience focuses on the development of applicable business continuity plans to resume critical operations.

Literature on developing decision models for business continuity management and recovery planning is scarce. Despite the eminent gap in literature, various researches have addressed immediate response and recovery planning for societal areas to study the response to natural disasters. (Das & Hanaoka, 2014, p. 622).

According to Runyan (2006, p. 12) literature on crisis management with regard to small business response to disasters, has been limited. In his study a qualitative approach has been applied to analyze how small business respond to and recover from large disasters. Findings derived from a study performed by Runyan (2006, p. 21) suggests that small business have difficulties overcoming these disruption due to a lack of planning, vulnerability to cash flow interruption and lack of access to capital for recovery. He also hinted that recovery for small business owners means something different as opposed to managers of large firms. Recovery not only means learning from the situation but most importantly getting back to normal. Not having to rely on others to be profitable and recover cash flow. The primary objective in a study performed by Kato and Charoenrat (2018, pp. 584-585) is to obtain a better understanding of current practices of business continuity management executed by Small-Medium firms. Results derived from their study showed that perceived disaster readiness, business continuity knowledge

and training needs to positively correlated to a degree of business size, disaster experience and operation period. In a study conducted by Fischbacher-Smith (2017, p. 25), the interaction between organizational performance and business continuity management within context of potential tensions between efficiency and effectiveness, has been researched. Results derived from their study indicate that there is an incoherent relationship between theorizing the concept of crisis management and applying practical-based approaches to improve the organizational performance of firms. Ishtiaq (2015, p. 211) investigated to what extent risk management processes are effective with regard to bank performance. Conclusions that were drawn from this study highlight that certain research gaps needs to be identified with regards to risk management and banks performance in developing countries such as Pakistan.

Results derived from a survey amongst 2729 respondents, conducted by Mercer, showed that roughly 60% claim to have a BCP in place in all of their locations to handle global outbreaks. About 20% of the respondents said that they do not have a BCP in place at the moment, but they are in the process of developing one. Only 5% of the participating firms claim to have no BCP in place at all and are also not considering developing one (Mercer, 2020, p. 1). The objective for business owners is to create a resilient firm. A business continuity plan could provide guidance during a time of crisis. Creating a roadmap could provide for clarity and structure on how to react at the time of a supply chain disruption. The development of a business continuity plan could be applied in conjunction with obtaining the preferred customer status as possible risk mitigation strategies.

In this study, a business continuity plan has been selected as subject of scrutiny, because it is the most comprehensive risk management tool, including all facets of risk management and could aid in tackling supply chain disruptions. Disaster recovery planning is less applicable as it is a post-disaster measure and more applicable to hurricanes or any "destructive" disasters.

2.5 Preferred Customer Status

Obtaining the preferred customer status has been introduced as new variable in this study in relation to risk management. The benefits derived from obtaining the preferred customer status are at the cutting edge of risk management and risk mitigation. These benefits could prove to be valuable at times of a supply chain disruption, such as preferential resource allocation and shared information. Surprisingly, the concept of preferred customer status at an SME level in relation to risk management has been neglected. The concept of preferred customer status is a relatively unknown area for SME managers, but the benefits could be valuable especially at times of a crisis. Therefore, this study offers new insights on how obtaining the preferred customer status could aid in mitigating supply chain disruptions.

2.5.1 History and definition

Customer attractiveness has been increasingly the subject of scrutiny in literature. Schiele, Calvi, and Gibbert (2012, p. 1178) depicted that there are two main drives which have increased the amount of articles with regard to the topic of customer attractiveness. One of these factors is a fundamental change in supply chains, which has led to an increased responsibility of suppliers. Another factor is a result from a lower number of supplier in many business-to-business markets.

This shift could be explained by a trend which shifted in house-production to suppliers. According to Roberts (2001, p. 239), this shift started out in the 90's as innovation shifted from a labatory-focused process to an open network-embedded innovation network. Chesbrough (2003, p. 43) argued that this change has been a result because of the increasing capabilities of suppliers.

Present day, it is well established that intensive and well maintained relationships with suppliers provide for many opportunities for firms. Previous research offers insights on how firms improved their performance outcomes through collaboration with suppliers (Nyaga, Lynch, Marshall, & Ambrose, 2013, p. 56). Summed up by Koufteros, Vickery, and Dröge (2012, p. 104), suppliers could offer their resources in various ways such as innovation, ideas, materials and skills. These resources could built onto to become competitive advantages which may not have been achieved otherwise. Nowadays, firms are strangled in a war with their competitors to find similar resources in same suppliers base. It is therefore not clear-cut that firms who intensively work together with their suppliers obtain a competitive advantage because there are more sharks in the pond who might have obtained better resources (Hatch & Dyer, 2004, p. 1155).

Schiele, Calvi, et al. (2012, p. 1178) emphasized the importance of becoming the preferred customer in their study. Basically, being the preferred customer implies that the buyer to whom their supplier allocated better resources than less preferred buyers. Being granted with the preferred customer status has several benefits for a firm such as first access to new technology or the allocation of scarce resources in times of high demand (Huttinger et al., 2012, p. 1194). The core principle here is that not all customers are being treated equally, due to resource scarcity suppliers are facing. Two distinctive principles are outlined to play an important role in becoming the preferred customer status namely customer attractiveness and supplier satisfaction (Huttinger et al., 2012, p. 1196). A customer is deemed to be attractive when the supplier has a positive expectancy towards the collaboration with this customer (Schiele, Calvi, et al., 2012, p. 1180). These expectancies are built on the expected value of customer which leads a supplier's interest to engage or strengthen a relationship. Additionally, examples of indicators of customer attractiveness include trustworthiness, timely payments, transparency and dependence (Pulles, Schiele, Veldman, & Hüttinger, 2016, p. 135). As such, attractiveness can be viewed as the interest of parties to strengthen or enter a relationship (Pulles et al., 2016, p. 131).

According to Schiele, Calvi, et al. (2012, p. 1181), "*suppliers satisfaction is a condition that is achieved if the quality of outcomes from a buyer-supplier relationship meets or exceeds the supplier's expectations*". Pulles et al. (2016, p. 131) echo this and add that suppliers satisfaction could be perceived as the feeling of equity or fulfillment when the outcomes are being accomplished. According to Zijm, Klumpp, Regattieri, and Heragu (2019, p. 71), there are several suppliers satisfaction factors which are operationalized by suppliers to rate the satisfaction a supplier experience with a particular customers. These factors include:

Growth opportunity: e.g., its more exciting to work with a customer whose turnover is growing.
Profitability: e.g., a supplier is perceived to be more satisfied if a buyer is paying fair prices
Relational behavior: e.g., the behavior of the buyers personnel in terms of reliability and openness could influence the supplier satisfaction.
Operational excellence: e.g., accurate forecasts, adequate responses and simplified processes are also factors found to positively influence the supplier satisfaction. Obtaining the preferred

customer status from your suppliers is a result of supplier satisfaction and customer attractiveness. Becoming the preferred customer could a firm that little edge over their competitors especially in times of crises in which each help and knowledge from your suppliers could be detrimental.

2.5.2 Preferred customer status in crisis times

A research gap has been identified with regard to becoming the preferred customer in order to mitigate supply chain disruptions. However, linking preferred customer status and handling operational risk can be explained as follows. Suppliers are inclined to share more of their capabilities such as skills, know-how and expertise with their preferred customer. Obtaining such information from renowned suppliers could be crucial when facing a major supply chain disruption, as these suppliers might have experienced it in the past and have learned from those situations. Sharing their skills and information could be the needle in the haystack to overcome such a disruption (Pellegrino, Costantino, & Tauro, 2020, p. 16). Another valuable measure of preferential resource allocation is that the supplier grants your firm with better access to organizational resources such as relationships with its partners, distribution channels and benchmark data, which could be used to develop mitigation strategies.

      Obtaining preferred customers, developing a business continuity plan are useful counter strategies in tackling supply chain disruptions. However, the core of the ability of the firm to tackle these disruptions lies within their response approaches to disturbances. As stated before, the importance of suppliers has increased over the past years. Other determinants have further emphasized the reaffirmed position of suppliers. According to Schiele, Calvi, et al. (2012, p. 1179), supply chain disruption stimulated research in preferred customer issues. Events such as the tsunami in Japan and the Arab spring has caused this renewed interest. In each situation suppliers had to choose which buyer would get their hands on the unsold supplies. Williamson (1991, p. 81) concluded that suppliers in markets will respond first to the needs of their preferred customer. As a result, non-preferred customers will come second and will be unable to harness innovation and influence in pricing decisions. Consequently, preferred customers are able to exert more influence in big decisions and experience lower risks in supply chain disruptions.

3. Hypotheses

In the theoretical review, various types of risks were identified and explained. In this study operational risk has been selected as the primary dependent variable which can be described as the risk which comprises business operations (e.g. human resources, product development and supply chain management, information/business reporting (e.g., budgeting and planning) and empowerment (e.g., leadership and readiness to change (Verbano & Venturini, 2013, p. 13). Additionally, the concept of risk management was briefly outlined and multiple risk mitigation strategies were discussed from which developing a business continuity plan and preferred customer status were selected in this study as the primary risk mitigation strategies. Moreover, several factors were identified to influence risk management in general such as agility, lack of trust and distortion of information. These factors are applicable to all firms but in particular to SMEs. SMEs do not have the access to capital to capital in comparison to their larger counterparts which makes them more vulnerable. On the contrary, due to their adaptive nature, SMEs perform well in the agility department which is important to overcome supply chain disruptions. In the hypothesis section, the research on SMEs with regard to risk will be combined with the research on preferred customer status and business continuity plans by taking the response approaches into account. Concluding, the combination of SME research, risk research and preferred customer status research will be incorporated into one model.

A flexible response approach could reduce the operational damage caused by a major supply disruption by removing any obstacles in information sharing. Bureaucracy and formalized procedures could hamper the ability to share information in a timely fashion. The above mentioned aspects suggests that firms whom take a flexible response stance, are potentially able to diminish the impact of supply chain disruptions such as the COVID-19 pandemic by removing any obstacles in information sharing and reducing mutual interdependence. Most importantly, the adaptive nature of a flexible response approach enables firms to modify response strategies promptly. The unpredictable nature of a pandemic and its progress causes firms to be able to promptly respond and modify strategies, to new policies/new guidelines set by their respective government. Adaptability is almost not only advisable but also required.

Therefore, hypothesis 1 is formulated as follows:

H1: "A flexible response approach reduces the operational damage of COVID-19"

The study performed by Azadegan et al. (2020, p. 45) expected a procedural response approach to reduce operational damage inflicted by a major supply chain disruption, because of its association with reliability, which improves response and recovery efforts due to the set standards and routines that decrease confusion and reduce divergent interpretations. However, no significant effect was detected to suggest that adopting a procedural response approach could potentially diminish the operational damage caused by a major supply chain disruption.
In contrast, in this study a real-time event has been applied as dependent variable instead of an experiment vignette based approach. Analyzing real-time data is influenced by many more variables than an experiment based approach. As such, the researched effect in this study could be different from what Azadegan et al. (2020) have researched also considering the control

variables which have been taking into account such as for example the sales volume and the financing methods business owners employed. Most importantly, small business were not the subject of scrutiny in the study performed by Azadegan et al. (2020, p. 61). As stated before, findings derived from a study performed by Runyan (2006, p. 21) suggests that small business have difficulties overcoming major disruptions due to a lack of planning, vulnerability to cash flow interruption and lack of access to capital for recovery. Adopting a procedural response approach could account for the lack of planning finding and therefore could lead to a different finding in this study. Yet the above-mentioned strategies are not mut

Therefore, hypothesis 2 is formulated as follows:

H2: A procedural response approach reduces the operational damage of COVID-19?"

A business continuity plan consists of three knowledge-enhancing attributes, including the identification of risks and resources, the specification of objectives with regard to risk and the management of disruption and the institutionalizing of business continuity practices (Faertes, 2015, p. 1402). The value that business continuity plans could bring is that firms are more aware of risks and the firm its capabilities. Business continuity plans also present a better understanding of the functional priorities during a period of recovery and it presents information about the mitigation strategies across the firm (Engemann & Henderson, 2014, p. 111). Firms which apply a flexible response strategy are focused on the adaptive and improvising efforts undertaken by the firm to reduce the operational damage inflicted by a major supply chain disruption. Improvisation could potentially lead to unexpected actions which are unknown for the whole staff, which can then lead to confusion, counterproductivity and possibly, waste of resources. Business continuity plans can offer assistance in solving conflicts over defining responsibilities and resources when a potential supply chain disruption pops up. Arguably, the development of a business continuity plans could potentially align functional tasks and resources, it can also aid in specifying the recovery objectives (Shaw, 2005, pp. 10-11). Therefore hypothesis 3 has been formulated:

H3: "Business continuity plans positively moderates the effect of a flexible response approach on the operational damage caused by COVID-19"

Firms who adopt a procedural response approach tend to over rely on procedures and standardization. Focusing too much on planning and procedures could hamper the flexibility of a firm when it comes to dealing with a major supply chain disruption (Myers, 1993, p. 98). Supply chain disruptions are characterized by an almost unpredictable and unique nature. Clamping on to procedures could almost be destructive when firms are facing an unpredictable enemy, it could also hamper the ability to process information effectively (Stallings, 2005, p. 9). In order to tackle the weaknesses of a procedural response approach, a business continuity plan aids to specify which strategies are optimal to mitigate the disruption. Moreover, according to Asgary (2016, p. 55), the development of a business continuity plan aids in raising awareness of risk levels, resources and improve functional efforts which in turn improves the information processing ability of the firm. Business continuity plans also simplify information processing by eliminating redundant procedures (Sheffi & Rice Jr, 2005, p. 44). Therefore, hypothesis 4 is

formulated as follows:

H4*: "Business continuity plans positively moderates the effect of a procedural response approach on operational damage caused by COVD-19"*

Firms who acquire the preferred customer status from their key suppliers are granted with preferential resource allocation. Preferential resource allocation could imply that at times of capacity bottlenecks, suppliers allocate scare resources to your firm instead of allocating them to other customers. That could give your firm that competitive edge in times of trouble. As mentioned above, suppliers are inclined to share more of their capabilities such as skills, know-how and expertise. Obtaining these information from renowned suppliers could be crucial when facing a major supply chain disruption, as these suppliers might have experienced it in the past and have learned from those situations. Sharing their skills and information could be the needle in the haystack to overcome such a disruption. Another valuable measure of preferential resource allocation is that the supplier grants your firm with better access to organizational resources such as relationships with its partners, distribution channels and benchmark data. Apart from this, suppliers are more likely to share their best ideas in terms of innovation with their preferred customer. Arguably, obtaining the preferred customer status could reduce the operational damage caused by a major supply chain disruption.

Therefore, hypothesis 5 is formulated as follows:

H5: "*Obtaining the preferred customer status negatively influences the operational damage of Covid-19."*
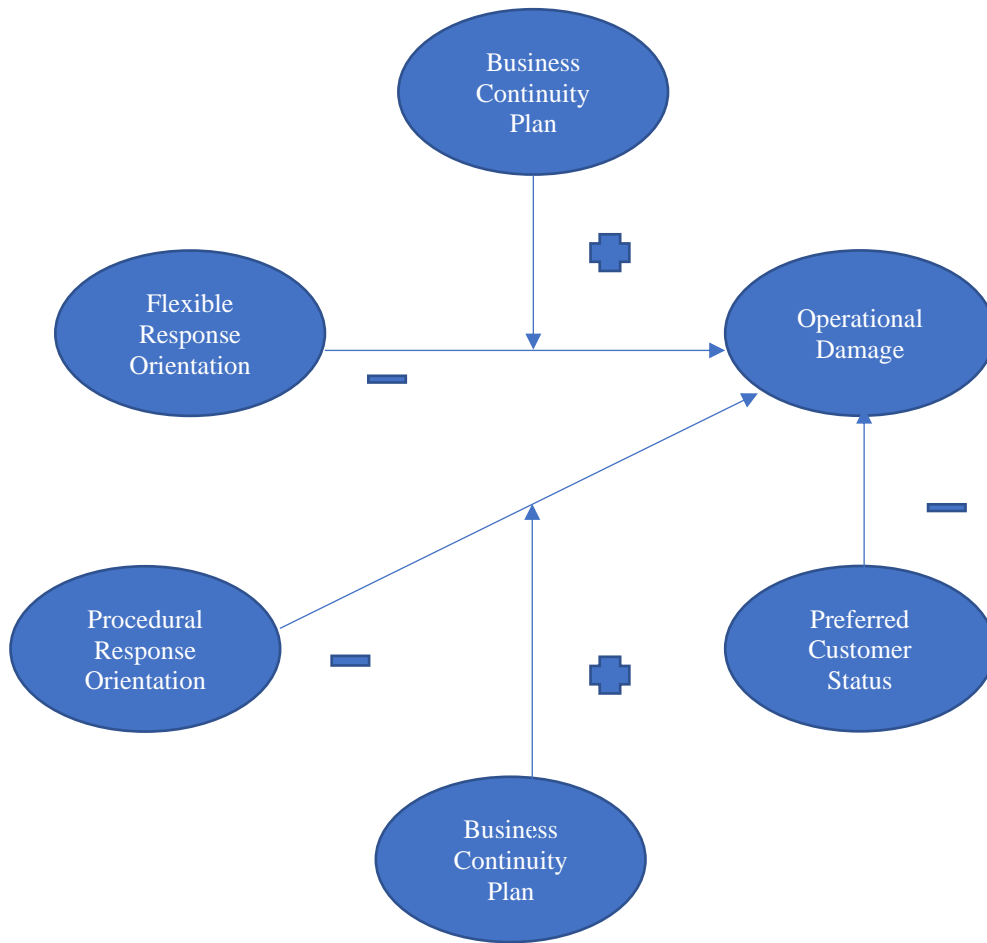
4. Methodology

4.1 Design

For this study, several designs were possible. For example, a single case-study design is an in-depth study and would allow for a clarification of an unknown phenomenon, like COVID-19. However, as a single case-study design does not allow for generalization, it was not chosen as a design for the current study, because one single firm is not representative of the problem that is examined and therefore, the hypotheses cannot be tested. Furthermore, a longitudinal cross-sectional design enables the analysis of the duration a phenomenon, such as COVID-19 and thereby contribute to the prediction of the future of this phenomenon and its influence on firms, based on what happened in the past. However, as a longitudinal research design takes a long period of time and hence, is more expensive, this type of design was unfeasible within the timeframe of a thesis project. Lastly, a cross-sectional design concerns data collection at one point in time and is usually conducted by means of surveys, hence, they are inexpensive and take little time. Nevertheless, findings are static, and time bound and cannot be used to establish cause and effect relationships. However, in the case of COVID-19, "time bound" results is not necessarily negative as this phenomenon is present right now and may not be in the near future due to vaccines. Thus, overall, a cross-sectional design is most fitting to this type of study, because it takes little time and is a good fit for a survey, the tool that is used in the current study.

A cross-sectional research design was applied with operational damage as the dependent variable, flexible response orientation, procedural response orientation and preferred customer status as independent variables. Moreover, business continuity plans were tested as a mediating variable. Lastly, control variables were added to account for non-spuriousness.

4.2 Sample

The target population of this study include individuals that own a firm (SMEs), located in Twente, the Netherlands, during the COVID-19 pandemic in 2020. Participants were excluded when their firm was not negatively nor positively influenced by COVID-19 at all. The markets in which the firm owners were active ranged from the hospitality industry, to IT, to the hairdressing industry. The firm's age ranged from 2 to 125 years, and the size of the firms ranged from 1 to 50 employees. Participants were recruited by means of social media, mainly the platform of LinkedIn, and additionally Facebook Messenger and Instagram were used. Firm owners mostly took part in this study because of the findings that may be of value to their company. 300 SME owner were reached out to from which 105 owners responded which is the equivalent of 35 % response rate. In the initial data collection N=105 companies participated in the questionnaire. However, N=45 participating companies were excluded from this study sample as their companies were not affected by Covid-19 and therefore considered not to be relevant with regard to the current study. The total number of companies eligible for the data analysis comprised of N=60.

The statistics derived from table 6 showed that the mean size of the participating firms is 15.60 employees, with 50 employees being the maximum and 1 being the minimum. Additionally, the average age of the participating firms was found to be 19.83 years, with 125 years being the maximum and 2 years the minimum. Furthermore, results showed that the majority of firms admitted they did not have experience with supply chain disruptions in the past, with the mean being 1.73 (1 = yes; 2 = no). With regard to the method of financing, there were four options (1 = own equity; 2 = bank loan; 3 = venture capital; 4= family/friends). The mean lies closest to 1 which implied that the majority of SME owners used their own capital to finance their company. Lastly, the competitiveness of the market was divided in three categories (1 = not competitive; 2 = fairly competitive; 3 = highly competitive). The mean was 2.47 which indicated that the majority of SME owners ranked the competitiveness of their respective markets to be in the middle of fairly competitive and highly competitive.

Table 6   Characteristics of participating companies

	Minimum	Maximum	Mean	Standard Deviation
Size of company in numbers	1	50	15.60	14.73
Age of company in years	2	125	19.83	24.37
Experience with supply chain disruptions in the past	1	2	1.73	0.45
Method of financing of company	1	4	1.32	0.60
Competitiveness of market	1	3	2.47	0.60

4.2.1 Industry distribution

With respect to the industry of the participating companies, the industries were categorized and the frequency and percentage were calculated (see table 7). Results revealed the service industry to be the largest category (n=18), including 30.0 percent of the companies. The health industry was the smallest category (n=2), representing 3.3 percent of the companies.

Table 7   Industry distribution of participating companies

	Frequency	Percentage
Services industry	18	30.0%
Construction industry	11	18.3%
Retail	9	15.0%
Events	3	5.0%
Media	3	5.0%
Health industry	2	3.3%
Catering industry	7	11.7%
IT industry	7	11.7%

4.3 Measurement

In this study a survey was distributed online amongst respondents, aimed at measuring the influence of response orientational types and business continuity plans on the operational damage inflicted by COVID-19 on firms. The survey items were partially based on a survey developed by Azadegan et al. (2020) which encompasses the items with regard to the response strategies and the operational damage constructs. Multiple efforts on their account have been made to improve the clarity, comprehensiveness, and relevance of the survey items, increasing the validity and reliability of the survey. What distinguishes the current study is the focus on COVID-19 used as practical event as major supply chain disruption whereas the study of Azadegan et al. (2020) do not specify; therefore, the survey items were adapted to be suitable for the current study. Additionally, the focus was on SMEs whereas in the study conducted by Azadegan et al. (2020), this separation was not made. The introduction of the preferred customer status in this study could potentially offer valuable insights due to the fact that literature on preferred customer and risk management is scarce, hence preferred customer status could potentially be viewed a different component of risk management. The survey items for preferred customer status were divided into three categories, namely Preferred Customer Status, Customer Attractiveness and Supplier Satisfaction and the survey items of those categories were based on surveys developed by Schiele, Veldman, and Hüttinger (2011, p. 20), Hüttinger, Schiele, and Schröer (2014, p. 720) and Cannon and Perreault Jr (1999, p. 448), respectively.

Respondents answered 51 survey items using a 5-point Likert scale (from 1=Highly Disagree to 5= Highly Agree) and 5 survey items with an open-ended format. The 56 survey items were covered in five domains, namely, Operational Damage, Business Continuity Plans, the Response Strategies, Preferred Customer Status and lastly, the Control Variables.

Operational Damage was assessed using eight items, and reflects the operational damage

inflicted by COVID-19. An example of a survey item is "Responsiveness to my company its customer demands has been affected to a major extent". A high score indicated that a firm was negatively impacted by COVID-19, whereas a low score meant that a firm was not negatively influenced, and even possibly positively influenced by COVID-19.

Business Continuity Plans was assessed using 6 items to measure to what extent the respondents made use of business continuity plans (e.g., "At my company, a business continuity plan is regularly tested"). A high score meant that a firm utilizes a business continuity plan, whereas a low score indicated that no such plan was in place. Moreover, concerning the response strategies, a division was made between procedural response and flexible response, each covering four survey items. The eight items measured which response strategy was most successful in diminishing the operational damage of supply chain disruptions. An example of a survey item regarding a procedural response is "At my company, use of established policies and procedures play a major role in disruption response" and for a flexible response, "At my company, decisions are made based on the situation at hand". A high score indicated that response strategies were applied in that particular firm, whereas a low score meant that such responses are not used in that particular firm.

Additionally, preferred customer status was assessed with thirteen survey items to measure whether having a preferred customer status aids in diminishing the operational damage of a supply chain disruption, such as COVID-19 (e.g., "The supplier has made sacrifices for us in the past"). A high score indicated that the firm received a preferred customer status from their supplier, whereas a low score meant that they did not have such a status. Lastly, control variables were added to account for non-spuriousness, with survey items such as "What is the size of your firm?" and "How has your company been financed?". These survey items were provided in an open format. For the complete survey, see Appendix A. All respondents were Dutch, to be able to view the Dutch version of this survey that was used for this study, see Appendix B.

Lastly, a correlation matrix (see table 8) was used to show Pearson's r between all factors, namely the moderator: business continuity plan; the control variables: size of company, age of company, experience with disruptions in the past, method of financing, and competitiveness of the market; and the direct effects: flexible response strategy during COVID-19, procedural response strategy during COVID-19, and lastly, preferred customer status. A high correlation, whether positive or negative (+1, -1) indicates that variables are associated with each other, and hence, are not independent. A low correlation (0), indicates that the variables are not associated with each other, and therefore, they are independent variables. There is a significant moderate correlation between a procedural response strategy during COVID-19 (independent variable) and the use of a business continuity plan (moderator)($r = .541$, $p = .01$). This is logical, as both procedural response strategy and a business continuity plan involve set standards and routines, and thus, a high correlation is to be expected. Furthermore, a significant moderate correlation is found between size of the company and age of the company ($r = .416$, $p = .01$). It would make sense that the variables size and age are related, because generally speaking, the bigger the size of the company, the older the company is, as the company follows

the trajectory from growth to saturation. Moreover, looking at the remaining coefficients, relatively weak correlations were found ranging from .002 to .389, which indicates that the remaining variables are weakly or not associated with each other, and therefore, are true independent variables. This discards multicollinearity as a potential problem.

Table 8 correlation matrix: Tested model between dependent variables, independent variables and control variables

	Preferred customer status	Flexible response during COVID-19	Procedural response during COVID-19	Actual operational damage	Competitiveness	Financing	Experience	Age of company	Size of company	BCP
Preferred customer status	1	.35**	.39**	.17	.17	.23	-.30*	.04	.02	.24
Flexible response during COVID-19	.35**	1	.23	.11	.104	.26*	-.13	.06	.02	-.02
Procedural response during COVID-19	.39**	.23	1	.34**	.076	.14	-.17	.19	.27*	.54**
Actual operational damage	.17	.11	.34**	1	-.14	.21	-.39**	.20	.18	.25
Competitiveness	.17	.10	.08	-.14	1	-.14	-.03	-.07	.13	.00
Financing	.23	.26*	.14	.21	-.14	1	-.25	.22	.04	.02
Experience	-.30*	-.13	-.17	-.39**	-.03	-.25	1	-.32*	-.25	-.14
Age of company	.04	.06	.19	.20	-.07	.22	-.32*	1	.42**	.33**
Size of company	.02	.02	.27*	.18	.13	.04	-.25	.42**	1	.29*
BCP	.24	-.02	.54**	.25	.00	.02	-.14	.33**	.29*	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.4 Data Analysis

The data analysis was carried out using SPSS 26. First, descriptive statistics such as minimum, maximum, mean and standard deviation of the firms' characteristics were calculated which included the age, size, competitiveness of market, experience with previous supply chain disruptions and method of financing company. A frequency table was created as an overview of the distribution of the industries of the firms. Furthermore, a Paired Samples Test was carried out to examine differences between predicted operational damage and actual operational damage, between procedural response s strategy before COVID-19 and procedural response strategy after COVID-19, and between flexible response strategy before COVID-19 and flexible response strategy after COVID-19 in order to see whether there is consistency in the response pattern of companies. Moreover, several Multiple Linear Regression analyses with 95%-confidence intervals were performed to predict the operational damage of COVID-19 based on the extent to which a flexible or procedural response orientation was used and to what extent a preferred customer status was obtained. Moreover, a Multiple Linear Regression analysis with 95% confidence intervals were conducted to test the possible mediating effect of business continuity plans on the relation of both response strategies to the actual damage caused by COVID-19. A multiple linear regression model was preferred over a single linear regression because multiple independent variables were used to predict the value of the dependent variable rather than a singular independent variable. Lastly, the regression model assumptions for multiple linear regression were tested, including a test of collinearity.

4.5 Data quality

With regard to the reliability, the data was tested for multicollinearity using collinearity statistics in the regression analyses, including tolerance and VIF values. Looking at the VIF values, a value of approximately 1 indicates no correlation between a given predictor variable and any other predictor variable in the model. A value between 1 and 5 would indicate a moderate correlation. If this value is greater than 5, indicating severe correlation, the regression output are highly likely to be unreliable. Looking at the VIF values in the three regression analyses in this study, the majority is approximately around the value of 1, which indicates that the output of the data in this study is reliable. Noteworthy is that in model 3, high values are detected of 12, 16, 25 and 45 for flexible response strategy, procedural response strategy, flexible response * BCP and procedural response * BCP, respectively. However, this is easily explained as those variables are used twice, once as a direct effect variable (e.g., flexible response strategy) and once as part of the moderator variable (e.g., flexible response * BCP). Therefore, as they are similar, they should correlate highly and as a result, produce a high VIF value, however, this does not influence the reliability.

Concerning the validity of the data, the Cronbach's alpha was calculated for preferred customer status, business continuity plan, procedural response strategy during COVID-19 and flexible response strategy during COVID-19, with a Cronbach's alpha of .861, .836, .829, and .613, respectively. Thus, a high internal consistency was found for preferred customer status,

business continuity plan and procedural response strategy during COVID-19. However, the internal consistency for flexible response strategy during COVID-19 was somewhat weaker, and findings related to this construct should be interpreted with caution.

5. Results

5.1 Hypotheses testing

The below presented table is categorized in three distinctive models. Model 1 includes all control variables in relation to the dependent variable. Model 2 tests the direct effects of the selected independent variables in relation to the dependent variable. The last model tests the moderating effect of BCP on the relation between the response strategies and the actual damage caused by Covid-19. The R square in model 1 was found to be .195 which implies that the control variables explain 19.5% of the variance in the actual damage caused by Covid-19. For model 2 the R square was found to be .267 which implies that the selected independent variables such as the response strategies and the preferred customer status, explain 26.7% of the variance in the actual damage caused by Covid-19. Lastly, in model 3 the R squared was found to be .281 which implies that moderating effect of BCPs on the response strategies in to relation to the actual damage caused by Covid-19, explain 28.1% of the variance in the actual damage caused by Covid-19. Additional information on the models can be found tables 12 -17 which can be found in Appendix C.

Table 9   Overview of multiple regression analyses.

| Variables | Dependent: Actual operational damage caused by COVID-19 | | | | | |
| | Model 1 | | Model 2 | | Model 3 | |
	B	SE	B	SE	B	SE
Control						
(Constant)	3.91**	.76	3.60**	1.1	3.65**	1.27
Size of company	.00	.01	.00	.01	.00	.08
Age of company	.00	.01	-.00	.01	-.00	.01
Experience	-.64*	.25	-.66*	.26	-.64*	.26
Financing	.14	.18	.13	.19	.21	.22
Competitiveness	-.21	.18	-.25	.18	-.12	.18
Direct effects						
Flexible Response Strategy			.03	.17	-.49	.53
Procedural Response Strategy			.33*	.15	.71	.50
Preferred customer status			-.07	.27	-.07	.28
Interaction						

				.154	.143
Flexible Response * BCP				.154	.143
Procedural Response * BCP				-.165	.163
R-square	.195		.267		.281

**. Correlation is significant at the 0.01 level.
*. Correlation is significant at the 0.05 level.
B= Beta
SE= Standard error

A multiple regression analysis was employed to ascertain the influence of a flexible response strategy during Covid-19 on the actual damage caused by Covid-19 (see table 9). Contrasting to the hypothesis, in table 10, results indicated that the application of a flexible response strategy is insignificant in both model 2 and 3 (B = .026 p >.05; B = -.491, p > .05, respectively). In model 2 and 3, the control variables are accounted for, with the exception of the variable of previous experience with supply chain disruptions, which is significant in both models (B = -.662, p < .05; B = -.644, p < .05). Concluding, hypothesis 1 is rejected which implies that the application of a flexible response strategy seems to have no influence on reducing the operational damage.

Secondly, a multiple regression analysis was conducted to test the influence of a procedural response strategy during Covid-19 on the actual damage caused by Covid-19 (see table 9). Contrasting to the expectations, the application of a procedural response strategy is positively significant as a direct effect in model 2 (B = .331 p < .05) instead of negatively significant as hypothesized. However, in the overall model (3), this effect is no longer significant (B = .712 p >.05). In model 2 and 3, the control variables are accounted for, with the exception of the variable of previous experience with supply chain disruptions, which is significant in both models (B = -.662, p < .05; B = -.644, p < .05). Concluding, hypothesis 2 is rejected which implies that the application of a procedural response strategy seems to have no influence on reducing the operational damage

Furthermore, in model 3, interaction terms were added to test the moderating effect of business continuity plans on the relationship between the response strategies and the operational damage caused by Covid-19. Result derived from model 3 in table 9 indicate that no moderating effect was detected with regard to both a flexible and procedural response strategy (B=.154, p >.05; B=-.165, p > .05, respectively). In model 2 and 3, the control variables are accounted for, with the exception of the variable of previous experience with supply chain disruptions, which is significant in both models (B = -.662, p < .05; B = -.644, p < .05). Concluding, hypotheses 3 and 4 are rejected which implies that business continuity plans does not seem to have a positive moderating effect on the response strategies in their relation to the operational damage caused by Covid-19.

In this study, obtaining the preferred customer status was added as new variable in relation to diminishing the operational damage caused by Covid-19. Contrasting to the hypothesis, no significant relationship was detected between preferred customer status and the actual damage caused by Covid-19 in model 2 and 3 (B=-.071, p > .05; B=-.066, p > .05, respectively). In model 2 and 3, the control variables are accounted for, with the exception of the variable of previous experience with supply chain disruptions, which is significant in both models (B = -.662, p < .05; B = -.644, p < .05). Concluding, hypothesis 5 is rejected which implies that obtaining the preferred customer status does not seem to have an influence in reducing the operational damage caused by COVID-19.

5.2 Additional analyses

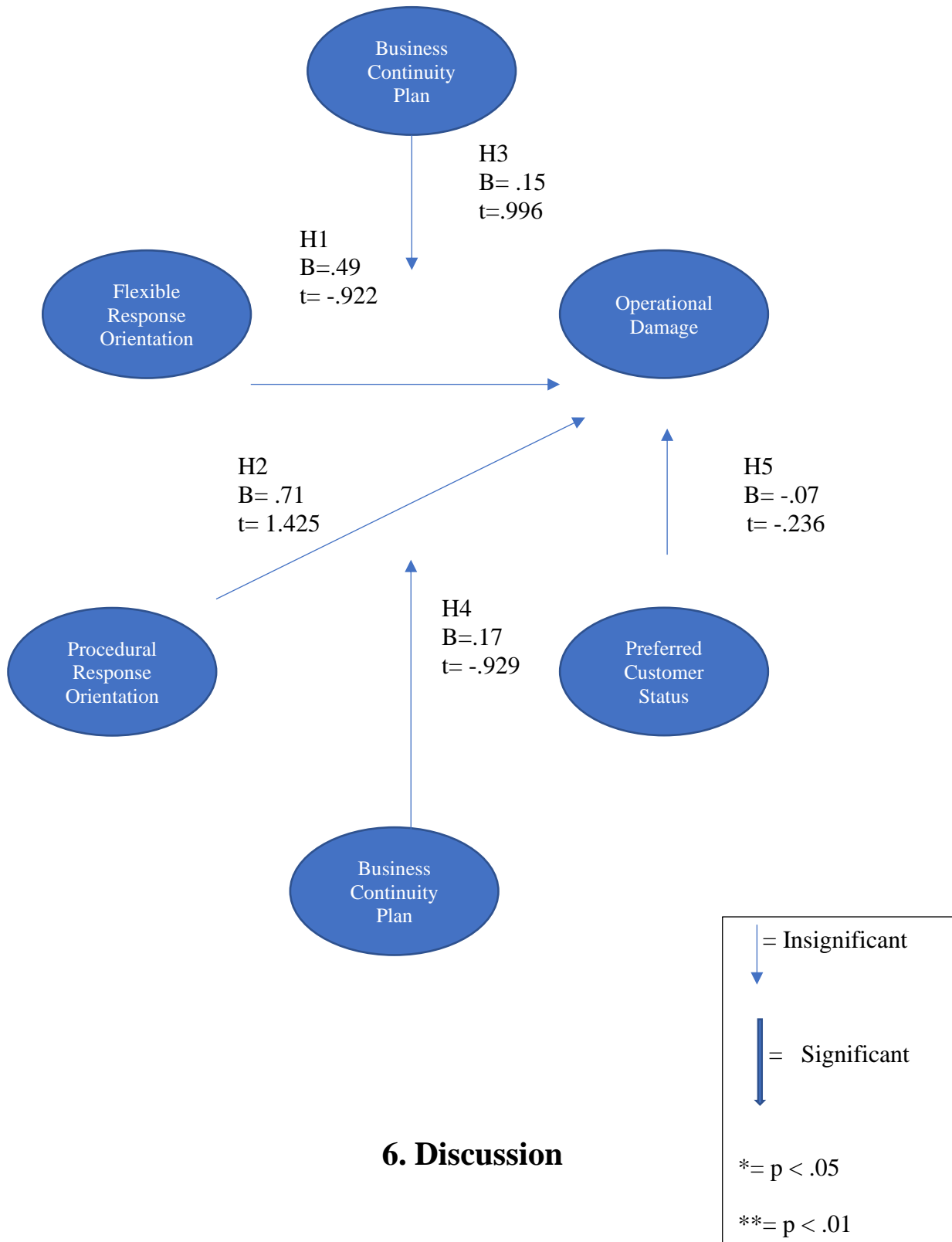**Table 10** Paired Samples Test – mean difference between response strategies before and during COVID-19

	Mean	Standard Deviation	95% CI		P-value
			Lower	Upper	
Pair 1 – operational damage	.11	.44	-.00349	.22433	p = .057
Pair 2 – procedural response strategy	-.08	.39	-.18469	.01803	p = .105
Pair 3 – flexible response strategy	-.16	.43	-.27456	-.05044	p = .005

These tests were performed in order to find out whether the selection for a respective response strategy changed during the Covid-19 period to account for the consistency with regard to a firms strategy. With respect to table 10, a paired samples test was executed to examine the differences between the response strategies before and during Covid-19. Additionally, it was examined whether there was a difference in the perceived vulnerability from the perspective of the SME owners compared to the actual damage caused by Covid-19. Firstly, the difference with regard the perceived and actual damage was found to be not significant (p=.057), indicating that the participating SME owners' perception of their firms vulnerability was not significantly different from the actual damage caused by Covid-19. Moreover, the difference in the application of a procedural response strategy before and during Covid-19 was also found to be insignificant (p=.105), indicating that no difference was identified in the application of a procedural response strategy before and during Covid-19. Lastly, the difference in the application of a flexible response strategy before and during Covid-19 was significant (p=.005),

indicating that a flexible response strategy has been applied more frequently during Covid-19 than before Covid-19.

Additionally, the presence of the preferred customer status was tested as a possible moderator although it was not part of the hypotheses. Obtaining the preferred customer status could enhance an already successfully implemented response strategy in order to reduce the operational damage caused by Covid-19 thereby having a possible moderating effect on the response approach in relation to the perceived operational damage. Nevertheless, a multiple regression analysis was performed to examine the possibility of a moderating effect of preferred customer status on the application of both a flexible and procedural response strategy in diminishing the actual damage caused by Covid-19. In both cases, no moderating effect was detected with regard to the application of a flexible and procedural response strategy ($p=.635$, $p=.797$, respectively).

5.3 Overall model

Business Continuity Plan

H3
B= .15
t=.996

H1
B=.49
t= -.922

Flexible Response Orientation

Operational Damage

H2
B= .71
t= 1.425

H5
B= -.07
t= -.236

Procedural Response Orientation

H4
B=.17
t= -.929

Preferred Customer Status

Business Continuity Plan

6. Discussion

= Insignificant

= Significant

*= p < .05

**= p < .01

6.1 Key Findings

The current study aimed to answer the question: "*To what extent does either a flexible response/ procedural response strategy or obtaining the preferred customer status reduces the operational damage caused by Covid-19 and what is the moderating effect of business continuity plans on the application of the response strategies.".* To address this matter, five hypotheses were formulated. To address the first hypothesis: *"A flexible response approach reduces the operational damage of COVID-19",* a multiple linear regression was performed with the application of a flexible response strategy during Covid-19 as independent variable and the actual operational damage caused by Covid-19 as dependent variable. The results of the analysis have shown no statistically significant evidence to support this hypothesis. Therefore hypothesis 1 is rejected which implies that the application of a flexible response strategy has no impact on diminishing the operational damage caused by Covid-19. Contrasting to the study of Azadegan et al. (2020), who found a significant effect of the application of a flexible response strategy on operational damage, whereas in the current study this relationship was found to be insignificant. This difference could potentially be explained by the practical approach taken in the current study in which Covid-19 was used a practical supply chain disruption whereas in the study of Azadegan et al. (2020) a hypothetical example was utilized in which real-life data was not part of the data collection which is not necessarily wrong, however the influence of real-life factors cannot be underestimated. Shaw (2005, p. 99) argued that improvisation could potentially lead to unexpected actions which are unknown for the whole staff, which can then lead to confusion, counterproductivity and possibly, waste of resources. The results in this study could potentially be explained by this argument.

      Secondly, the hypothesis "*A procedural response approach reduces the operational damage of COVID-19?"* was investigated. Results revealed that the relation between the application of a procedural response strategy to diminish the operational damage of Covid-19 was insignificant in the overall model. The beta was found to be positive which implies that if SME owners were more lenient towards applying a procedural response strategy in attempting to lessen the operational damage inflicted by Covid-19, the higher the actual damage was. The positive beta could be possible explained that those firms who experienced the most damage, were those who adopted a procedural response strategy. Concluding, hypothesis 2 is rejected. However, as results showed in table 9 the beta and standard error were found to be relatively, but were not significant. A possible explanation for this finding is the small sample size. Moreover, the loss of significance from model 2 to model 3 could be explained by the presence of interaction terms in model 3. As mentioned in the methodology section, procedural response strategy and a business continuity plan correlated significantly with each other, indicating that they essentially provide similar information, and hence, the procedural response strategy may no longer act as an independent variable, losing its significance. In alignment with this finding, Myers (1993, p. 98) concluded that firms who adopt a procedural response approach tend to over rely on procedures and standardization. Focusing too much on planning and procedures could hamper the flexibility of a firm when it comes to dealing with a major supply chain disruption. In the study performed by Azadegan et al. (2020), a significant relationship between procedural response and operational damage was not found. A reason for this contrasting finding is possibly that the operational damage derived from a hypothetical assessment supply chain disruption could differ from the actual operational damage caused by an actual and real-life supply chain disruption.

For both hypotheses 3: *"Business continuity plans moderates the effect of a flexible response approach on the operational damage caused by COVID-19:* and 4: *"Business continuity plans moderates the effect of a procedural response approach on operational damage caused by COVD-19"* a regression analysis was performed to examine the possible moderating effect of a business continuity plan with either the flexible response strategy (H3) or the procedural response strategy (H4) as independent variable and the actual operational damage caused by COVID-19. In both cases, no significant moderating effect was found. A business continuity plan is regularly seen as useful tool in dealing with supply chain disruptions. A business continuity plan could compensate the flaws in each respective response strategy.. Therefore, both hypothesis 3 and 4 are rejected. Contrastingly, the mediating effect on the both response strategies was found to be significant with regard to the study performed by Azadegan et al. (2020). This difference between findings in the respective studies could be attributed to the fact that managers of large firms were included in the study sample of Azadegan et al. (2020) whereas only owners of SME firms were included in the current study. Arguably, business continuity plans are applied more frequently in larger firms in comparison to SMEs, which could partially explain the difference in the findings. Additionally, a possible explanation could be that SME owners view risk management tools such as BCPs as expensive and time consuming. Their reasoning could be that due to low frequency of occurrence, the trade-off between sunk costs/opportunity costs and actual prevention is negative in their perception. Developing a business continuity plan could be valuable as it creates structure and enhances focus.

Lastly, with regard to hypothesis 5: *"Obtaining the preferred customer status reduces the operational damage of Covid-19."*, neither a significant effect nor a mediating effect was found for preferred customer status on operational damage caused by Covid-19. This indicates that obtaining the preferred customer status from your suppliers has no significant impact on lessening the operational damage caused by a supply chain disruption such as Covid-19. Therefore, hypothesis 5 is rejected. However, in literature on preferred customer status several benefits were outlined of obtaining the preferred customer status in times of trouble. For example, suppliers sharing their skills and information could be the needle in the haystack to overcome such a disruption. Another valuable measure of preferential resource allocation is that the supplier grants your firm with better access to organizational resources such as relationships with its partners, distribution channels and benchmark data. This finding could be attributed to the fact that the concept of obtaining of preferred customer status is relatively undiscovered in literature in conjunction with SMES. Additionally, SME owners are frequently oblivious with regard to the concept of preferred customer status and are therefore unaware of the possible benefits derived from obtaining this.

The control variables size of firm, age of firm, financing method of company, the experience with previous supply chain disruptions and competitiveness of firms' respective market were accounted for in all tested regression models. However, the variable experience with previous supply chain disruptions was found to be significant, indicating that this variable has a significant influence on the relationship between the response strategies and operational damage. The beta in the overall model with regard to this variable was found to be negative, implying that the more experience firm owners had with previous supply chain disruptions, the lower the actual damage was for these firms. This could potentially be attributed to SME owners who experienced a disruption in the past and followed certain strategies which were successful and therefore, implemented these strategies again this occasion.

Taking all information from the hypotheses into account to answer the research question, it is concluded that neither a flexible response strategy nor a procedural response strategy diminishes the operational damage caused by Covid-19. Moreover, obtaining the preferred customer status does not diminish the operational damage caused by Covid-19. Lastly, the use of a business continuity plan as risk management tool did not moderate the relationship of the response strategies on the operational damage caused by Covid-19.

With regard to development of the survey, some questions were perceived to contain too much business jargon which could have influenced their understanding of the items. Moreover, the translation of the items into Dutch could have caused any confusion as some concepts are better explained in English than in Dutch. Additionally, all SME owner admitted that they had enough information to answer all items, in other words the survey was sufficiently understandable.

6.2 Practical implications

Multiple insights are to be derived from this study. This study contributes to literature by explaining the role that preferred customer status can play in lessening the damage caused by a major supply chain disruption. In order to survive supply chain disruptions, organizations need to respond adequately to these events. If these response strategies are not properly managed, the resources of organizations might proof to be ineffective and could lead to be even more exposed in light of a supply chain disruption. Applying a flexible response strategy stimulates adaptiveness and resilience in order to overcome such disruptions. On the contrary, applying a procedural response strategy can lead in a higher efficiency in execution and it could result in better preparedness. These effects were not found in the current study, however a hybrid strategy combining the flexible and response strategy is perhaps the most suitable option to be able to compensate the flaws of each respective strategy. Having experience with previous supply chain disruptions is viewed as a good omen in overcoming obstacles, However, holding on to rigid procedures and the avoidance of improvisation could lead to an even more negative impact of the disruption itself. It is advisable to leave room for improvisation as every supply chain disruption is different than the next, but also try to learn from previous experiences. Applying risk management strategies and tools do not have to be expensive nor extensive. Developing simple checklists and applying scenario planning could make a difference in overcoming the disruption or not.

6.3 Limitations and future research

In the current study several limitations need to be considered. First, respondents from a cross-section of industries from one specific region in one country were included in the study sample while Covid-19 is categorized as global pandemic. The differences between regions, even in one country could be significant with regard to how hard they were hit by the consequences of Covid-19. In this study for example, the selected region was mildly hit in comparison to other regions in the same country and even in comparison to other countries. Another important limitation is the application of a cross-sectional framework, which can cause concerns with

regard to causality. This study introduced the concept of preferred customer status in relation to supply chain disruptions. In the questionnaire, SME owners were asked about their perception on supplier satisfaction from the suppliers point of view. Assumptions were made on behalf of the supplier, rather than the own perception of the supplier with regard their satisfaction about their customers. The perception of suppliers could differ from the assumptions from their customers and this could potentially influenced the results. Moreover, the alpha of the items that measured flexible response strategy in the questionnaire, was relatively low, which could have potentially influenced the results. Lastly, a low sample size was used in this study which could possibly explain the insignificant findings, as the power to detect significance is lower with a smaller sample.

Taking the above mentioned limitations into consideration, future research is advised to be conducted. At first, research on the response strategies in relation to supply chain disruptions should be executed on a global scale with a larger sample size, accounting for geographic regions due to the dynamic character of this global pandemic. Moreover, not only should Covid-19 be used a sole supply chain disruption, but these response strategies should also be studied with regard to other major supply chain disruptions with different characteristics in the future to obtain more insights on these response strategies in general. In studies performed by Park et al. (2013) and Latour (2001), consequences were outlined as a result of a major supply chain disruption. It could be interesting to study retrospectively which response strategies have been applied in order to tackle these disruptions and which have been successful in doing so, for further justification on this topic. Also, for future supply chain disruptions these analyses could prove to be interesting. Furthermore, it would be interesting to explore the preferred customer status more in depth from both the customer and supplier perception in relation to the response strategies as the current study only covers the customers perception. Moreover, another study opportunity is exploring the possible benefits of applying business continuity plans in relation to tackling different disruptions with different characteristics. Lastly, the internal consistency of the items that measured the construct of flexible response strategy should be improved by rephrasing or erasing them and adding new items.

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8. Appendixes

8.1 Appendix A- English version of the survey

This survey is based on the survey developed by Azadegan et al. (2020), in their study "supply chain disruptions and business continuity: an empirical assessment". The items are similar to the work of Azadegan et al. (2020), however, the items enlisted in the survey below are adapted in such a way that they are geared towards COVID-19 and SME firms located in Twente, the Netherlands.

Introductory question: Has your company been affected at all by the Covid-19 outbreak? Yes/No		
1. In your opinion, to what extent is your company impacted by COVID-19 as related to the following performance dimensions?		
Operational Damage	*1-Highly Disagree, 3- Neutral, 5-Highly Agree*	
	Perceived vulnerability	*Actual Damage*
1- Overall efficiency of my company its manufacturing operations has been affected to a major extent	*1-2-3-4-5*	*1-2-3-4-5*
2-Responsiveness to my company its customer demands has been be affected to a major extent	*1-2-3-4-5*	*1-2-3-4-5*
3-The On-time delivery for my company its final products to customers has been affected to a major extent	*1-2-3-4-5*	*1-2-3-4-5*
4- The order accuracy for my company its final products to customers has been affected to a major extent	*1-2-3-4-5*	*1-2-3-4-5*
5-The sales volume of my company has been affected to a major extent	*1-2-3-4-5*	*1-2-3-4-5*
6- Procurement costs & price of purchased items for my company has been affected to a large extent	*1-2-3-4-5*	*1-2-3-4-5*
7-The product quality of my company its final product(s) has been affected to a large extent	*1-2-3-4-5*	*1-2-3-4-5*
8-Access to technology for my company has been affected to a large extent	*1-2-3-4-5*	*1-2-3-4-5*

B. In your opinion, to what extent does your company has a Business Continuity Plan or Crisis Management Plan in place?	
	1-Highly Disagree, 3- Neutral, 5-Highly Agree
Business Continuity Plans	
1-At my company, systems are in place to detect supply chain disruptions	*1-2-3-4-5*
2-At my company, a crisis response plan has been regularly updated	*1-2-3-4-5*
3-At my company, management has a documented activation and assessment plan	*1-2-3-4-5*
4- At my company a business continuity plan is considered as an method for anticipation or resilience	*1-2-3-4-5*
5-At my company, lines of communication between management and staff are clear during a period of crisis	*1-2-3-4-5*
6-At my company, risk management fulfills an important role	*1-2-3-4-5*

C. The validation of your understanding of the situation:		
Procedural Response - Please rate the extent to which you perceive for your company to use procedural response strategy in addressing supply chain disruptions in general.		
1-Highly Disagree, 3- Neutral, 5-Highly Agree		
	Before Corona	*During Corona*
1-At my company, roles, responsibilities and ownership of problems are rigidly followed.	*1-2-3-4-5*	*1-2-3-4-5*
2-At my company, how past disruptions have been managed is documented and referred to.	*1-2-3-4-5*	*1-2-3-4-5*
3-At my company, use of established policies and procedures play a major role in disruption response.	*1-2-3-4-5*	*1-2-3-4-5*
4-At my company, allocating resources is through formalized requests and approvals.	*1-2-3-4-5*	*1-2-3-4-5*
Flexible Response - Please rate the extent to which you perceive for your company to use flexible response strategy in addressing supply chain disruptions in general.		
1-Highly Disagree, 3- Neutral, 5-Highly Agree		
1-At my company, ad-hoc and emergent decisions are relied upon heavily.	*1-2-3-4-5*	*1-2-3-4-5*
2-At my company, plans are flexible and modified throughout the course of a disruption.	*1-2-3-4-5*	*1-2-3-4-5*
3-At my company decisions are made based on the situation at hand.	*1-2-3-4-5*	*1-2-3-4-5*
4-At my company, following the chain of command takes a back seat to addressing the disruption.	*1-2-3-4-5*	*1-2-3-4-5*

D. Preferred Customer Status.	
Preferred customer status - Please rate the extent to which you receive preferred customer status from your key supplier. [1]	
1-The supplier has made sacrifices for us in the past	*1-2-3-4-5*
2. The supplier cares for us	*1-2-3-4-5*
3- In case of shortages, this supplier has gone out on a limb for us	*1-2-3-4-5*
4- We feel this supplier is on our side	*1-2-3-4-5*
5- The best resources of this supplier work for us	*1-2-3-4-5*
Customer Attractiveness- Please rate the extent to which you rate your company being attractive to your key supplier? [2]	
1- Our firm had positive expectations towards profitability and large sales volumes from our relationship with this supplier	*1-2-3-4-5*
2- We expected to be able to innovate with this supplier	*1-2-3-4-5*
3- We expected future improvements through collaboration with this supplier	*1-2-3-4-5*
4- In general, we expected positive outcomes from current and future relationships with this supplier	*1-2-3-4-5*
Supplier Satisfaction- Please rate the extent to which you rate your key supplier has a satisfactory feeling about your firm.[3]	
1-Our supplier is very satisfied with the overall relationship with us	*1-2-3-4-5*
2- Generally, our supplier is very pleased to have us as business partner	*1-2-3-4-5*

[1] (Schiele et al., 2011, p. 20)

[2] (Hüttinger et al., 2014, p. 720)

[3] (Cannon & Perreault Jr, 1999, p. 448)

3-If our supplier had to do it all over again, they would still choose us as customer	*1-2-3-4-5*
4- Our supplier does not regret the decision to business with us	*1-2-3-4-5*

E. Control variables	
1-What is the size of your firm?	*1-2-3-4-5*
2- How long is your firm in business for?	*1-2-3-4-5*
3- Did you encounter a similar supply chain disruption in the past?	*1-2-3-4-5*
4. How has your company been financed?	*1-2-3-4-5*
5- How would you rate the competitiveness of your market?	*1-2-3-4-5*

8.2 Appendix B- Dutch version of the survey

Introductie vraag: Is uw bedrijfsvoering beïnvloed door de covid-19 pandemie?

1.   In welke gradatie is uw bedrijf beïnvloed door covid-19 met betrekking tot de volgende prestatie dimensies?

Kunt u voor de volgende onderwerpen aangeven in welke mate uw bedrijf door Covid-19 is beïnvloed?

Let op het gaat hier in de linkerkolom om de verwachte impact van uw bedrijf voor Covid-19. Het gaat hier om uw verwachting ten aanzien van de onderstaande onderwerpen AAN HET BEGIN van de lockdown in Nederland en dit heeft dus niet daadwerkelijk hoeven plaatsvinden, het gaat om uw verwachting van destijds.

In de rechterkolom gaat het om de daadwerkelijke schade die is geleden door Covid-19 tijdens de lockdown tot op heden.

Het gaat hier om een negatieve invloed.

1.   The algemene efficiëntie mbt onze productie activiteiten zijn substantieel beïnvloed door covid-19
2.   Onze responsiviteit klanten is beïnvloed negatief door Covid-19
3.   De punctuele levering van onze producten/diensten naar klanten is negatief beïnvloed door covid-19
4.   De nauwkeurigheid van de bestelling verwerking ten aanzien van onze producten/diensten is negatief beïnvloed door Covid-19
5.   De verkoop volume van ons bedrijf is negatief beïnvloed door covid-19
6.   De inkoopprijzen van de door ons ingekochte producten zijn negatief beïnvloed door covid-19
7.   De kwaliteit van onze eind producten is negatief beïnvloed door covid-19
8.   Onze toegang tot technologie is negatief beïnvloed door covid-19

9.   Naar uw mening, in welke hoedanigheid bestaat er een business continuity plan binnen uw bedrijf?

(Een business continuity plan kan worden omschreven als procedures voor momenten dat het niet "business as usual" is, zoals verstoringen in de bedrijfsvoering, calamiteiten en crisissituaties. Zulke procedures worden vastgelegd in een bedrijfscontinuïteitplan).

1.   Wij gebruiken systemen die supply chain verstoringen detecteren.

2. De crisis response plan (een draaiboek met procedures die wordt opgevolgd ten tijde van calamiteiten of crisissituaties) wordt regelmatig ge-update.
3. Management heeft een gedocumenteerde activatie en assessment plan (methode om bedrijf continuïteit te waarborgen.
4. Een business continuity plan wordt beschouwd als een methode voor bestendigheid
5. De communicatielijnen tussen management en personeel zijn duidelijk gedurende crisissen.
6. Risk management speelt een belangrijke rol.

7. Geef alstublieft aan in welke mate een procedurele response strategie wordt gebruikt ter anticipatie van supply chain verstoringen zowel voor Covid-19 (voor de lockdown) als tijdens Covid-19(tijdens de lockdown in Nederland).

Flexibel Respons Strategie

Geef alstublieft aan in welke mate een flexibele respons strategie wordt gebruikt ter anticipatie van supply chain verstoringen.

1. Wij zijn afhankelijk van Ad-hoc en improviserende besluitvorming.
2. Plannen en strategieën zijn flexibel en worden continu aangepast gedurende een supply chain verstoring
3. Besluitvorming is gebaseerd op de situatie die zich op het moment zelf voordoet ipv dat het besluit vooraf al is bepaald
4. Gedurende een supply chain verstoring, wordt de hiërarchie binnen ons bedrijf gevolgd.

Procedurele Respons

.

1. Rollen, verantwoordelijkheden en eigenaarschap mbt problemen worden strikt gehanteerd.
2. Het management van crisissen uit het verleden is gedocumenteerd en wordt aan gerefereerd tijdens actuele crisissituaties
3. Het gebruik van gevestigde procedures en bedrijfsbeleid speelt een grote rol mbt de response naar supply chain verstoringen.
4. Middelen worden toegewezen via formele verzoeken en goedkeuringen.

5.   Preferred Customer Status

Geef alstublieft aan in welke mate uw bedrijf de voorkeursstatus heeft mogen ontvangen van jullie leveranciers.

1.   Onze leveranciers heeft opofferingen gemaakt voor ons in het verleden
2.   Onze leverancier zijn met ons begaan.
3.   In het geval van tekorten, hebben onze leveranciers ons ondersteund.
4.   Wij hebben het gevoel dat onze leveranciers aan onze kant staan.
5.   Wij gebruiken de beste middelen van onze leveranciers.

Klant aantrekkelijkheid

Geef alstublieft aan in welke mate uw de aantrekkelijkheid van u bedrijf klasseert

1.   Wij hadden positieve verwachtingen van onze relatie met onze leveranciers mbt verkoopvolumes.
2.   Wij verwachtten dat wij in staat waren om te innoveren met onze leveranciers.
3.   We verwachtten toekomstige verbeteringen door de samenwerking met onze leveranciers.
4.   Over het algemeen, verwachtten wij positieve uitkomsten van huidige en toekomstige samenwerkingsverbanden met onze leveranciers.

Tevredenheid van de leverancier.

Kunt u inschatten in welke mate uw leveranciers tevreden zijn over de samenwerking met uw bedrijf?

1.   Onze leveranciers zijn zeer tevreden met de algemene samenwerking met ons
2.   Over het algemeen zijn onze leveranciers content met ons als business partner
3.   Als onze leveranciers alles opnieuw zouden moeten doen, zouden ze voor ons kiezen als partner.
4.   Onze leveranciers hebben geen spijt van het besluit om met ons zaken te doen.

Controlerende variabelen

1.   Wat is de grootte van uw bedrijf?
2.   Hoe lang bestaat uw bedrijf (in jaren)?
3.   Heeft u eerdere supply chain verstoringen ervaren in het verleden?
4.   Hoe heeft u uw bedrijf gefinancierd?

5.   Hoe zou de competitiviteit van uw markt klasseren?

8.3 Appendix C tables of results

Model 1

Table 12   model 1 summary

Model	R	R square	Adjusted R square	Std. Error of the estimate
1	·.441[a]	.195	.120	.79154

[a]= Predictors: (Constant), with control variables size, age, experience, financing, and competitiveness

Table 13   Coefficients model 1

Model		Unstandardized B	Coefficient Std. Error	Std. coefficient Beta	t	Sig.	95% CI Lower	95% CI Upper	Collinearity statistics Tolerance	Collinearity statistics VIF
1	(Constant)	3.914	.764	-	5.125	.000	2.383	5.446	-	-
	Size	.006	.008	.106	.773	.443	-.010	.022	.785	1.273
	Age	.000	.005	.010	.070	.945	-.009	.010	.742	1.347
	Experience	-.643	.252	-.340	-2.548	**.014**	-1.149	-.137	.839	1.192
	Financing	.137	.183	.097	.751	.456	-.229	.504	.894	1.119
	Competitiveness	-.214	.178	-.151	-1.207	.233	-.571	.142	.948	1.055

[a]. dependent variable: actual operational damage

Model 2

Table 14   model 2 summary

Model	R	R square	Adjusted R square	Std. Error of the estimate
1	·.516[a]	.267	.152	.77719

[a]= Predictors: (Constant), procedural response strategy during COVID-19, flexible response strategy during COVID-19, preferred customer status, control variables: size, age, experience, financing, and competitiveness

Table 15   Coefficients model 2

Model		Unsta ndardi zed B	Coeffici ent Std. Error	Std. coefficie nt Beta	t	Sig.	95% CI Lower	95% CI Upper	Collinearity statistics Toleranc e	Collinearity statistics VIF
1	(Constant)	3.382	1.218	-	2.777	.008	.937	5.827	-	-
	Size	.002	.008	.042	.301	.765	-.014	.018	.741	1.350
	Age	.000	.005	-.011	-.079	.937	-.010	.009	.734	1.363
	Experience	-.626	.257	-.331	-2.437	**.018**	-1.143	-.110	.779	1.284
	Financing	.102	.187	.072	.546	.588	-.274	.478	.822	1.217
	Competitiveness	-.232	.179	-.164	-1.300	.199	-.591	.126	.903	1.107
	Flexible response	.008	.167	.006	.045	.964	-.328	.343	.827	1.209
	Procedural response	.298	.139	.293	2.139	.037	.018	.577	.764	1.308
	Preferred customer status	-.071	.274	-.038	-.259	.796	-.622	.480	.686	1.459

[a]. dependent variable: actual operational damage

Model 3

Table 16   model 3 summary

Model	R	R square	Adjusted R square	Std. Error of the estimate
1	.530[a]	.281	.135	.78497

[a]= Predictors: (Constant), procedural response strategy during COVID-19, flexible response strategy during COVID-19, preferred customer status, control variables: size, age, experience, financing, and competitiveness, procedural response * BCP, flexible response * BCP

Table 17   Coefficients model 3

		95% CI	Collinearity statistics

Model		Unsta ndardi zed B	Coeffici ent Std. Error	Std. coefficie nt Beta	t	Sig.	Lower	Upper	Toleranc e	VIF
1	(Constant)	3.645	1.270	-	2.870	.006	1.093	6.196	-	-
	Size	.001	.008	.025	.176	.861	-.015	.018	.725	1.379
	Age	-.002	.005	-.060	-.397	.693	-.013	.008	.639	1.564
	Experience	-.644	.260	-.340	-2.474	**.017**	-1.167	-.121	.775	1.291
	Financing	.213	.220	.151	.969	.337	-.229	.655	.607	1.646
	Competitiveness	-.198	.184	-.140	-1.077	.287	-.567	.171	.871	1.148
	Flexible response	-.491	.532	-.387	-.922	.361	-1.561	.579	.083	12.020
	Procedural response	.712	.499	.701	1.425	.160	-.292	1.715	.061	16.496
	Preferred customer status	-.066	.278	-.035	-.236	.814	-.624	.493	.680	1.470
	Flexible response * BCP	.143	.144	.607	.996	.324	.431	.039	.039	25.325
	Procedural response * BCP	-.152	.163	-.761	-.929	.358	.176	.022	.022	45.771

[a]. dependent variable: actual operational damage