

Fostering Resilience of Smes to Supply Chain Disruptions: The Role of Relationships

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Abstract

The global spread of the recent coronavirus outbreak has disrupted supply chains in both unanticipated and unprecedented ways. In the wake of such numerous catastrophic incidents, the core notion of supply chain resilience has sparked the attention of countless researchers and practitioners. However, the supply chain resilience of Small and Medium-sized Enterprises (SMEs) remains rather under-researched to date. In such turbulent times, it is important to investigate the role of relationships in achieving supply chain resilience in the context of SMEs. Thus, the overall intention of this study is to explore the influence of supply chain relationships on the resilience of SME supply chains by exploring the impacts of both outsourcing and collaboration. A well-structured online questionnaire was administered by selecting respondents using stratified random sampling techniques. In order to measure all the variables, a 5-point Likert scale was used. The survey was administered to a total of 160 SMEs and 114 valid responses were returned (response rate of 71.25%). Quantitative data was analyzed using correlation and regression analysis with the help of SPSS tool. The results of the study revealed that both outsourcing, and collaboration positively influences supply chain resilience. Therefore, the study recommends SMEs to engage in outsourcing and collaborative processes to foster resilience in supply chains during turbulent times. To the best of the author's knowledge the present study is one of the first study done regarding SME supply chain resilience in Sri Lanka. The study recommends SMEs to focus better on outsourcing techniques and collaborative procedures in order to nurture supply chain resilience. Therefore, the guidance of this study will provide future scholars and practitioners to pursue an effective study in the field. The present study was limited to quantitative methods to achieve the objectives of the study. Hence, the authors recommend future researchers to focus on qualitative methods that can aid in the advancement of knowledge.

Keywords: Collaboration, COVID-19, Outsourcing, Small-Medium Enterprise (SME), Supply chain resilience.

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Introduction

Today's increasingly dynamic and tumultuous world has given rise to continual turbulence along the supply chain. As a result, the academic and practitioner community has placed the fundamental concept of supply chain resilience at the forefront of their research agendas (Ivanov and Das, 2020; Remko, 2020). However, despite the fact that the importance of resilient supply networks has been stressed by numerous academics throughout the supply chain management literature, this core notion still lacks a complete definition (Kamalahmadi and Parast, 2016). Nevertheless, researchers of the present study rely on definition given by the widely cited study of Ponomarov and Holcomb (2009) which defines supply chain resilience as the "adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function" (Ponomarov and Holcomb, 2009, p. 131). To the authors of this study, the fundamental concept of supply chain resilience is merely the capability of the supply chain to persist, adopt and recover in the face of unexpected events.

The core concept of supply chain resilience has gained a renewed focus amidst the global pandemic which has triggered unprecedented disruptions along the supply chain (Golgeci and Ponomarov, 2013; Ivanov and Das, 2020). This is mainly due to the fact that the recent COVID-19 epidemic exposed various supply chain vulnerabilities by disrupting supply networks all across the world. In compliance with a research done by the Chartered Institute of Procurement and Supply, the coronavirus pandemic has affected 86% of supply chains around the world (Movement, 2020). Even before COVID-19 was proclaimed a pandemic by the World Health Organization, almost 95% of Fortune 1000 companies had been experiencing disruptions in the supply chain networks (Fortune, 2020). Moreover, an astounding amount of 1,438 epidemics was documented by the WHO between 2010 and 2018 (Hudecheck, 2020). As a consequence, the core notion of supply chain resilience is presently at the heart and soul of supply chain management perspectives (Ivanov and Das, 2020; Chowdhury et al., 2021). However, in accordance with a study by Remko (2020), prevailing supply chain resilience research has not yet reached its full ability. Hence, the academic and practitioner community have posed frequent requests for further study on supply chain resilience to be conducted in the literature relating to supply chain management.

Supply Chain Resilience Among Small and Medium Enterprises (Smes).

In today's ever-changing corporate climate, the mere question of an organization's survival has never been more prominent than it has been recently (Conz, Denicolai and Zucchella, 2017). Hence, the concept of supply chain resilience is regarded as a critical strategic competence (Ali, Mahfouz and Arisha, 2017). This core notion of supply chain resilience is much more predominant in the context of SMEs as they are more vulnerable to crisis (Ballesteros and Domingo, 2015). This is despite the fact that SMEs are the key contributor in many economies around the world, including Sri Lanka. However, studies relating to supply chain resilience among SMEs remain rather scarce (Kamalahmadi and Parast, 2016; Bak et al., 2020).

The Sri Lankan National Policy Framework for SME development has defined SMEs as enterprises with an annual turnover not more than Rs. 750mn while employing less than 300 people. The SME sector currently contributes to 52% of GDP and employs approximately 2.25 million people contributing to 45% of domestic employment. The importance of the sector is further highlighted by the fact that SMEs account for over 75% of establishments in the country. Based on the above justifications, GOSL considers SMEs to be the backbone of the economy (Ministry of Industry and Commerce, 2015).

Table 1: Definition of SMEs.

Size/Sector	Criteria	Small	Medium	Micro
Manufacturing	Annual Turnover	Rs. Mn. 16-250	Rs. Mn. 251-750	Rs. Mn. 15 or less than Rs. Mn. 15
	Number of Employees	11-50	51-300	
Service	Annual Turnover	Rs. Mn. 16-250	Rs. Mn. 251-750	Rs. Mn. 15 or less than Rs. Mn. 15
	Number of Employees	11-50	51-200	

Source: Ministry of Industry and Commerce (2015).

Despite the fact that SMEs are an essential segment of the economy, evidence suggests that such enterprises are less equipped to deal with disruptions than larger firms (Bucher, Jäger and Cardoza, 2016). According to a study by Marife and Sonny (2015), SMEs are particularly vulnerable to disruptions because they operate in highly dynamic and resource-constrained situations.

COVID-19, a low probability-high effect disaster, currently has severe implications for SMEs, resulting in disrupted supply networks (Lu et al., 2020). According to a study conducted by Wedawatta, Ingirige, and Amaratunga (2010), this could be related to a lack of disaster preparedness. The author went on to say that if supply networks do not recover, the consequences will be even worse. Hence, it is evident that the COVID-19 pandemic necessitates increased resilience in SMEs' supply networks. Resilience within the context of SMEs is defined as "an important characteristic of SMEs competing in today's business environment" (Kumar and Sosnoski, 2011, p. 5432). A minor change in a small firm in a supply chain can have a large influence on the entire network (Lu et al., 2020). As a result, the resilience of SMEs is beneficial to the larger supply chain networks (Haraguchi, Lall and Watanabe, 2016). Hence, the resilience agendas of SMEs are notable, especially in developing countries such as Sri Lanka. When taken as a whole, it can be stated that the financial well-being of the country is contingent on SMEs being or learning to be resilient (Bhamra, Dani and Burnard, 2011). However, the vagueness surrounding the notion posed a significant question of how SMEs may attain resilience in their supply networks.

Thereby, the objective of this research is to provide to the current literature on supply chain resilience methods in SMEs in a timely and significant manner. The current study contributes to supply chain resilience by investigating the role of relationships in fostering SME supply chain resilience. The authors of the study achieved this objective by exploring the inadequately addressed relationship existing between collaboration and outsourcing and supply chain resilience of SMEs.

Collaboration

Collaboration is known as the "glue that holds supply chain organizations together in a crisis" (Richey, 2009, p. 623). Collaboration helps to improve a resilient supply chain by integrating the supply network (Sheffi, 2001). The notion of collaboration entails information exchange and sharing knowledge to increase visibility and decrease uncertainty (Scholten, Scott and Fynes, 2014). Therefore, the basis of collaboration is said to be mutuality of benefit, sharing of rewards and risk along with the interchange of data (Barratt, 2004). Since supply chain resilience is a network wide concept, it is insufficient for solely a single enterprise to endeavor for flexibility, velocity and visibility; the determinative elements of supply chain resilience must be essentially implemented by all partners of supply chain to come together in case of a disruptive occurrence (Jüttner and Maklan, 2011). Therefore, in the modern business world, collaboration in the supply chain is of paramount

importance. However, a study done by Scholten and Schilder (2015) states that there is insufficient knowledge regarding how collaboration exactly influences supply chain resilience. Conversely, Whipple and Russel (2007) have considered collaboration to be a factor which increases the resilience of organizations against disruptions. In a similar vein, Andres and Poler (2013) argue that it is a must for SMEs to collaborate in order to be more resilient.

Outsourcing

Outsourcing is a key strategy of SMEs in highly competitive modern world. This concept helps to create highly efficient supply chains (Ouabouch, 2015). A study published by Bak et al. (2020) states that it is important to comprehend the interrelatedness between outsourcing and supply chain resilience as elevated dependence on the outsourcing partners can have an influence on supply chain resilience of SMEs. However, it was evident from a review of previous studies that outsourcing was mainly studied in the context of large organizations instead of SMEs (Bhalla, Sodhi and Son, 2008; McIvor, 2009; Smogavec and Peljhan, 2017). Nevertheless, Sugimoto and Tanimizu (2018) states that outsourcing has generally been a valuable tool for supply chain resilience. To accomplish resilience in the supply chain, effort is required from both internal parties and external parties. Evidence suggests that upstream supply disruptions are more critical than disruptions from other elements in the supply chain. Therefore, outsourcing is a crucial business activity that acts as a bridge amongst internal and external parties (Pereira, Christopher and Lago Da Silva, 2014).

The current research is the first to emphasize on supply chain resilience in the SME context, in comparison to previous research articles done in the Sri Lankan context. Only the apparel and construction industries have been the focus of the limited measures undertaken to improve supply chain resilience in Sri Lanka. Nevertheless, few limitations were encountered during the completion of the study and are mentioned below.

Limitation of the Study

Despite the fact that the authors of this study went to great lengths to create a genuine and reliable study, there were a few flaws that needed to be resolved. The study's main disadvantage was its narrow scope, as just 114 SMEs were sampled out of Sri Lanka's nearly countless SMEs. Nonetheless, the authors of this study used a stratified random sampling technique to collect a sample from the official database of Sri Lanka Chamber of Small and Medium Industries. Another disadvantage of the current study was that it was limited to outsourcing and collaboration functions exclusively. Furthermore, the research was constrained by time and financial constraints.

Moreover, because data was gathered using questionnaires, the question of whether respondents answered the survey honestly remained. Furthermore, when seeking personal information about educational levels from employees of SMEs, there were certain difficulties. Certain businesses declined to participate in the survey because they were hesitant to divulge critical information. The telephone conversation, on the other hand, aided in the completion of the data collection phase. Lastly, the current study was constrained by a scarcity of literature on SCM and SMEs in the Sri Lankan context.

Research Problem /Issue

Even though completely avoiding supply chain interruptions is a commendable aim, it is hard to achieve because disruptions are unavoidable. As a result, businesses must devise strategies for dealing directly with unavoidable situations. Building supply chain resilience is one approach to address the issue. Hence, researchers are finding ways to build resilience into the supply chain. Bak et al. (2020) found that the link between outsourcing, collaboration, and supply chain resilience in the context of SMEs is a critical yet inadequately addressed knowledge gap in supply chain management literature after reviewing 101 publications published between 2006 and 2019. It is critical to address this gap in knowledge by examining the influence of a heavy reliance on outsourcing partners/collaborators on SMEs' supply chain resilience as SMEs are heavily involved in outsourcing. Furthermore, according to a study conducted in Sri Lanka, supply chain resilience receives only limited attention (Sugathadasa, Perera and Liyanage, 2020). As a result, not only will this study stimulate more research, but it will also commence an empirical analysis of supply chain events around COVID-19 in the context of SMEs. Bridging the gap highlighted in this study aids in the management of outsourced partners and collaborators in a way that greatly improves the supply chain resilience of SMEs. In light of this objective, the present research pursued to resolve the following research questions: (1). What is the relationship between collaboration and supply chain resilience in SMEs during COVID-19? (2). What is the relationship between outsourcing and supply chain resilience in SMEs during COVID-19? (3). What is the impact of collaboration on supply chain resilience in SMEs during COVID-19? (4). What is the impact of outsourcing on supply chain resilience in SMEs during COVID-19?

Objectives

Individual business entities, such as small and medium businesses, should be aware of the integrated supply network to which they are connected to and work collaboratively to improve supply chain resilience. There is currently limited knowledge about how supply chain partners, such as collaborators and outsourced partners, can help SMEs promote supply chain resilience.

Given the importance of building small and medium enterprise resilience to the country's overall economy, the main objective of this study is to ensure small and medium enterprise survival during unforeseen events. As a result, the study focuses on four objectives, which are listed below.

Main Objective- To determine the interrelation among outsourcing, collaboration, and supply chain resilience in SMEs during the COVID-19.

Sub Objectives

1. To ascertain the relationship existing between collaboration and supply chain resilience in SMEs during COVID-19.
2. To ascertain the relationship existing between outsourcing and supply chain resilience in SMEs during COVID-19.
3. To determine the impact of collaboration on supply chain resilience in SMEs during COVID-19.
4. To determine the impact of outsourcing on supply chain resilience in SMEs during COVID-19.

Theoretical Considerations and Empirical Evidence

Social Capital Theory (Sct)

According to the Social Capital Theory, social interactions and relationships with people, communities, and nations are critical in obtaining resources that are both real and intangible riches (Coleman, 1988). Social capital is defined as “the sum of the actual and potential resources embedded within, available through, and derived from the relationships possessed by an individual or social unit” (Nahapiet et al., 1998, p. 243). Individuals and organizations inside their social networks are a major premise of this theory. Furthermore, according to contemporary studies, social capital is seen as a potential hedge against adversity (Aldrich and Meyer, 2015). The three dimensions established by Nahapiet and Ghoshal (2009) have been utilized to investigate social capital in supply chain resilience. Strong and weak relationships can help build resilience because strong ties deliver extraordinary qualities and social cohesion, whilst weak ties offer access to fresh opinions and resources (Jackson and Young, 2016). When it comes to coping with, adjusting to, and

surviving bad developments, social capital is crucial (Adger, 2003). Companies may utilize social capital to proactively maintain supply chain resilience while keeping costs under control and having slack resources since it is an external resource that does not suffer proportionate expenses with increased use.

Resource-Based View (RBV)

The resource-based perspective concentrates on gaining a durable competitive advantage by utilizing the firm's internal resources that are valuable, scarce, difficult to imitate, and non-substitutable. To gain a competitive edge, RBV emphasizes the importance of the two notions of resources and capabilities. The pivotal work done by Barney (1999) led to the development of this concept. Organizations should not only develop and build resources that support competitive advantage, but also those that reinforce the company to guarantee operational continuity in tumultuous times, according to RBV (Wernerfelt, 1984). As a result, in a volatile and unpredictable environment, distinct talents are required to properly utilize its resources (Wang and Ahmed, 2007). Therefore, supply chain resilience is deemed as a skill that can effectively and efficiently recover from disturbances (Brandon-Jones et al., 2014; Ambulkar, Blackhurst and Grawe, 2015; Davidson et al., 2016). According to David Asamoah (2020), capabilities such as resilience can be developed through internally and externally sourced resources, which will make sustainable operational performances through establishments.

Methodology

To determine the association among supply chain resilience and the underlying collaborative and outsourced activities of SMEs, an empirical analysis was conducted. In this research, Sri Lanka was chosen as the research context. This was based on the justification that firms located in developing countries such as Sri Lanka are continuously and frequently impacted by supply chain disruptions. The Sri Lankan National Policy framework for SME development defines SMEs as firms with an annual turnover no greater than LKR 750 Mn and employing fewer than 300 employees (Ministry of Industry and Commerce, 2015). A stratified random sampling approach was adopted to identify a representative sample of SMEs registered under the Sri Lanka Chamber of Small and Medium Industries from various sectors such as manufacturing, construction and engineering, footwear and textiles, beverages and food, power and energy, trading, chemical and pharmaceutical and packaging. Thereby, a total of 160 survey questionnaires were administered to registered SMEs in Sri Lanka. Out of the firms sampled,

114 valid responses were received, accounting for a retrieval rate of 71.25%. A study conducted by Bak et al. (2020) suggests that surveys were frequently used to comprehend the complexity of SMEs' supply chain. Moreover, Bharna et al. (2011) suggested that studies on supply chain resilience should focus more on surveys to verify theoretical constructs. Hence, an online survey questionnaire was utilized as the data collection instrument as suggested by Yi Lu, Jing Wu, Junlin Peng & Li Lu (2020), given the pandemic lockdown conditions. The questionnaire pertaining to the present study was formulated centered on an analysis of the current literature from researchers such as Sadi Assaf Mohammad A. Hassanain Abdul-Mohsen Al-Hammad Ahmed AlNehmi (2011), Chowdhury and Quaddus (2016), Smogavec, Darja peljhan et al. (2017). The survey questionnaire was segregated into four sections. The first section focused on demographic data of SMEs and SMEs' employees, the second section consisted of data regarding the dependent variable SME supply chain resilience, the third section consisted of independent variable collaboration while the final section focused on the other independent variable, outsourcing. Data collection was administered from 5 June-10 August 2021. All factors were measured by means of a 5- point Likert scale whereby the Likert scale varied between '1' - '5', where "1" signified strongly disagree, "2" signified disagree, "3" signified neutral, "4" signified agree, and "5" signified strongly agree. Hence, the coding of the Likert

scale is as follows, (1 = Strongly disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly agree). As a strategy to reduce the non-response rate, the questionnaire was first electronically distributed and then was followed up through telephone calls. As a consequence, 114 valid responses were received in total. To avoid concerns with responder identification, the answers were anonymized.

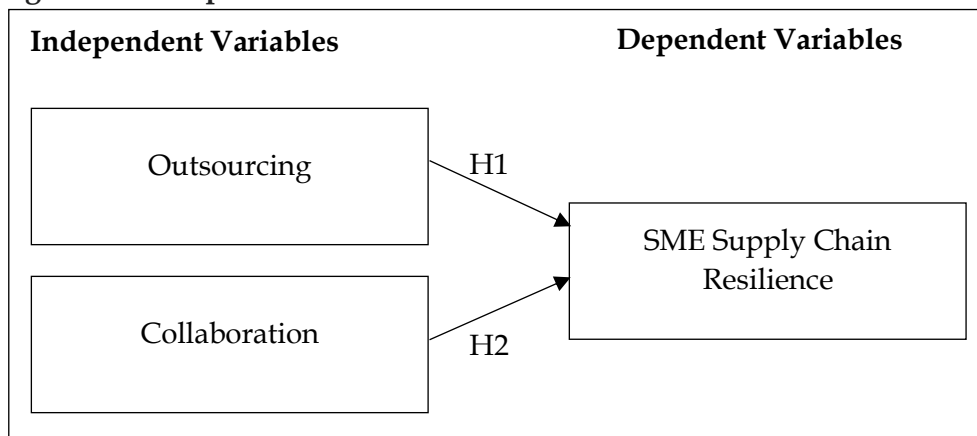
Furthermore, the exploration of ethical difficulties that arise when people are involved as participants in research is of particular relevance to research ethics. In order to maintain the study's ethical standards, special care was taken when gathering data from respondents. A researcher's particular statement describing the objective of the data collection and the confidentiality of the gathered information was included in the questionnaires delivered to the respondents. The nature of the study was made clear to the responders, emphasizing the study's value to society. To protect the respondent's identity and opinions, all data was collected and recorded anonymously. Furthermore, in order to maintain a good study, research participants were given the freedom to fill out the questionnaire as well as the capability to withdraw from the survey at any moment.

This section explains the approach employed in accordance with Saunders, Lewis, and Thornhill’s research onion model. Duong and Chong (2020) noted that studies in relation to supply chain disruptions are mostly quantitative. Quantitative research is usually associated with the positivist paradigm. Hence, the present study implements the positivism approach based on the philosophical viewpoint of the natural scientist. The research approach pertaining to the study is the deductive approach as the validity of assumptions at hand by designing a research strategy. Moreover, the researchers adopted a survey research strategy as mentioned above. The research choice pertaining to the study was the mono approach as the study addressed the issues using only quantitative data collection methodologies and corresponding quantitative analytical procedures. Furthermore, the current study is cross-sectional since all observations were made at a given point in time. Finally, the strategies and procedures used are at the heart of the research onion framework. In line with this, Correlation analysis and Multiple regression analysis were performed to evaluate the data in this study utilizing computer software tools such as IBM SPSS. However, the validity and reliability of the data were tested as a preliminary analysis before moving to the primary data analysis methods.

Conceptual Model

The conceptual framework given below (Figure 1) was developed because of the substantial literature review that was conducted. The proposed conceptual framework of the current study, which was developed from previous literature and consists of the three variables SME supply chain resilience, collaboration, and outsourcing, is depicted in the figure below.

Figure 1: Conceptual Framework



Source: Authors’ illustrations.

By extension of the understanding gained through the review of literature, it could be argued that the level of outsourcing and collaboration could significantly influence the supply chain resilience of SMEs. Based on this argument, two hypotheses were developed as below.

H₁: Outsourcing Has a Significant Impact on The Supply Chain Resilience of Smes In Sri Lanka.

Outsourcing allows businesses to drastically improve supply chain resilience (Sugimoto and Tanimizu, 2018). Organizations that outsource business operations, according to Domnguez (2006), have fewer risks than companies that do not outsource business processes. The author further noted that outsourcing is a strategy employed by businesses to strengthen their competitive edge. Furthermore, according to a contemporary study conducted by Liu et al. (2020) and Settanni (2020), building supplier dependency through outsourcing can help lessen the influence of COVID-19 on the supply chain. Small businesses can benefit from outsourcing non-essential company operations to third parties to boost the value they provide (Kirk and DePalma, 2005). As a result, outsourcing is a viable way for SMEs to meet their objectives by concentrating on critical skills and competences (Edvardsson and Durst, 2013). As a result, the authors of the study believe that outsourcing has a major impact on the supply chain resilience of Sri Lankan SMEs.

H₂: Collaboration has a Significant Impact on The Supply Chain Resilience of Smes in Sri Lanka.

Collaboration is the basic element of cultivating supply chain resilience, according to various studies in supply chain management literature. Scholten and Schilder (2015), for example, found that collaborative activities such as information exchange, collaborative communication, mutual creation of knowledge development, and collaborative relationship efforts improve supply chain resilience by increasing speed, flexibility, and visibility. Furthermore, Wieland and Wallenberg (2013) conducted research on the influence of relationship capacities, demonstrating how collaborative relationships can improve supply chain resilience. Collaboration between supply chain partners has also been shown to boost resilience by permitting real-time information sharing and cooperative planning (Whipple and Russell, 2007). Collaboration also aids supply chain partners in improving operational effectiveness (Shahbaz et al., 2015). Similarly, teamwork performs a critical role in establishing supply chain resilience for SMEs. Small and medium-sized businesses, according to Andrés and Poler (2013), must collaborate in order to be more flexible. Bak et al. (2020) pointed out that “resilience is not only related to the resilience of SMEs, but also the

performance of collaboration resilience of their partners” (Bak et al., 2020, p. 9). Therefore, the author of this study proposes that collaboration has a substantial impact on the resilience of Sri Lanka's SME supply chain.

Results and Discussion

The study brings into focus the impact of outsourcing and collaboration on supply chain resilience in the context of Sri Lankan SMEs. This section summarizes the survey's key findings, which are reinforced by a series of tables. The findings of the study show that independent variables such as collaboration and outsourcing have a favorable effect on supply chain resilience. The conclusions of the collaboration are compatible with existing supply chain management literature (Scholten and Schilder, 2015; Sugimoto and Tanimizu, 2018).

Demographic Characteristics and Business Profile Of Respondents

The data for the present study was acquired from 114 small and medium firms registered under Sri Lanka Chamber of Small and Medium Industries. The table below (Table 2) summarizes the findings on demographic characteristics and business profiles of respondents. The demographic content entails the size of the enterprise, sector of the enterprise, duration of operation of enterprise, level of education of the respondent, designation of the respondent and the number of years the respondent served in the enterprise.

Table 2: Characteristics of Demographic Information on SMEs/SME Employees

Variable	Frequency	Percentage
Size		
Small	59	51.8%
Medium	55	48.2%
Sector		
Manufacturing	61	53.5%
Footwear and Textile	12	10.5%
Construction and Engineering	14	12.3%
Power and Energy	7	6.1%
Trading	5	4.4%
Beverages and Food	11	9.6%
Chemical and Pharmaceutical	2	1.8%
Packaging	2	1.8%

Variable	Frequency	Percentage
Duration of operation of the enterprise.		
Less than 5 years	16	14%
Between 5- 10	16	14%
Between 11-20	24	21.1%
Above 20	58	50.9%
Level of education		
Diploma	41	36%
Bachelor's degree	50	43.9%
Master's degree	21	18.4%
PhD	2	1.8%
Designation		
Top/senior manager	40	35.1%
Supply chain/logistics manager	12	10.5%
Operations manager	15	13.2%
Executive	47	41.2%
Years served		
Less than 3 years	27	23.7%
3- 5 years.	33	28.9%
6-8 years.	18	15.8%
9 years and above.	36	31.6%

Source: Authors' compilation.

According to Table 2, the majority of the businesses that took part in the survey were small businesses (51.8%). Because Sri Lanka has a large number of small businesses, a high representation of small businesses was expected. However, the study's representation of medium-sized businesses was strong, with 48.2% of businesses being medium-sized. As a result, it can be concluded that both small and medium sized businesses have contributed equally to the study.

The nature of SMEs sectors is also captured in Table 2. The manufacturing sector received the largest proportion (53.5%), while construction and engineering received the second highest percentage (12.3%) with 14 responses. The Footwear and textiles sector accounted for 10.5%, while power and energy sector accounted for 6.1%, with the trading sector accounting for 4.4%. Furthermore, the chemical and pharmaceutical sector, as well as the

packaging industry both had an equal representation of only 1.8%, meanwhile, a 9.6% representation of the food and beverage sector was seen. Because the sample was chosen using a stratified random sampling procedure, this deviation can be permitted.

From Table 2, out of the 114 SMEs sampled, only 16 (14%) have been in operation for less than five years. Another 14% of organizations have been in operation between 5 and 10 years. Moreover, SMEs that have been in operation between 11 and 20 years are 24 (21.1%). Those that have been in operation more than 20 years are 58 (50.9%).

According to the table given above, the majority of the respondents held a bachelor's degree accounting for 43.9% (50) of the total respondents. Whereas only 1.8% of respondents were in possession of a PhD qualification. Moreover, 35.1% (40) of the respondents were top/senior managers, while the majority of respondents were executives representing 41.2% (47) of the total respondents. Finally, Table 2 indicates that the many of the respondents had served a total of 9 years and above.

Reliability and Validity Tests

Before moving into primary analysis of the collected data, a preliminary analysis was conducted with the intention of ensuring the validity and reliability of the results. Therefore, the Kaiser-Meyer-Olkin (KMO) index and the Bartlett's Test of Sphericity were conducted to guarantee the sufficiency of the sample size. The table given below shows the results of both the KMO index and the Bartlett's Test of Sphericity.

Table 3: Overall Validity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of sampling Adequacy		0.808
	Approx. Chi-Square	1654.307
Bartlett's Test of Sphericity	Df	378
	Sig.	0.000

Source: Authors' compilation.

As seen above, significant results were returned by both the KMO index and the Bartlett's Test of Sphericity. Hence, it can be concluded that the present study has an adequate sample size.

Table 4: Reliability Test

Variables	Cronbach's Alpha coefficient	Number of questions
Supply chain resilience	0.964	15
Collaboration	0.940	5
Outsourcing	0.962	8

Source: Authors' compilation.

Cronbach's alpha results for supply chain resilience were 0.964, collaboration was 0.940, and outsourcing was 0.962. As a result, the internal consistency and reliability of the measures utilized in this study are satisfactory. Furthermore, because the sig. (2-tailed) significant value of 0.000 is less than 0.05, it was determined that all items in the scale were valid.

Correlation Analysis

Pearson correlation, according to Uma Sekaran (2012), denotes the direction, intensity, and significance of bivariate correlations among variables. As a result, the current study used a two-tailed Pearson correlation to ascertain the association between outsourcing and collaboration on supply chain resilience. The correlation analysis results in the table below (Table 5) show that both correlations are significant.

Table 5: Correlation

		Res	Coll	Out
Res	Pearson Correlation	1	.475**	.448**
	Sig. (2-tailed)		.000	.000
	N	114	114	114
Coll	Pearson Correlation	.475**	1	.581**
	Sig. (2-tailed)	.000		.000
	N	114	114	114
Out	Pearson Correlation	.448**	.581**	1
	Sig. (2-tailed)	.000	.000	
	N	114	114	114

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

The link between each of the independent factors and the dependent variable was all significant at the 95 percent confidence level, as shown in the correlation summary in the above table. The findings show that collaboration and SMEs' supply chain resilience have a favorable link ($r=0.475^{**}$). Furthermore, the researchers discovered that the association was statistically significant at the 1% level ($p=0.000, 0.01$). Similarly, outsourcing and SMEs'

supply chain resilience have a favorable link ($r=0.448^{**}$). Furthermore, the association was determined to be statistically significant at the 1% level ($p=0.000,0.01$).

Regression Analysis.

The impact of the variables of outsourcing and collaboration on supply chain resilience characteristics was evaluated using regression analysis to further assess the links between supply chain resilience and functions of outsourcing and collaboration. The assumptions of normality, linearity, homoscedasticity, multicollinearity, outliers and the assumption of sample size were all met before conducting multiple regression analyses. The degree of strength and direction of the linear association between research variables was then determined using multiple regression analysis. The regression analysis findings are reported in the table below (Table 6).

Table 6: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
				R Square Change	F Change	df1	df2	Sig. F Change
.520 ^a	.271	.257	.52355	.271	20.581	2	111	.000

Collaboration and outsourcing were regressed against supply chain resilience, as seen above. The factors collaboration and outsourcing may predict 25.7% of the variance in supply chain resilience, according to R square.

Table 7: Coefficient

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error				Lower Bound	Upper Bound
(Constant)	1.230	.309		3.985	.000	.792	1.970
Coll	.405	.085	.475	4.736	.000	.117	.479
Out	.255	.087	.259	2.585	.012	.064	.466

Note: a. Dependent Variable: Res.

The contributions of individual predictors in the model are expressed as beta coefficient values. Collaboration has a beta of 0.405. In other words, while all other parameters remain constant, a one-unit increase in collaboration accounts for a 0.405 improvement in overall supply chain resilience.

Outsourcing has a beta of 0.225, which means that while all other parameters are held equal, one unit increase in outsourcing accounts for a 0.225 rise in overall supply chain resilience. As a result, both collaboration and outsourcing have a significant positive relationship with supply chain resilience.

Conclusions

As the world becomes more complicated, supply chains must provide accurate products in the correct quantities to the the right place, at the right time in highly unpredictable markets. Such volatile market conditions have now paved the way for global supply chain disruptions (Pettit, T. J., Fiksel, J. and Croxton, 2010). Therefore, the underlying notion of supply chain resilience, which gives supply chains the potential to bounce back from negative occurrences – i.e., to return to normalcy – is gaining traction in the literature relating to supply chain management. Despite the fact that supply chain resilience is still deemed to be in its infancy, a large amount of research has been published so far (Craighead et al., 2007; Blackhurst, Dunn and Craighead, 2011). The current study's authors shed light on an under-researched topic: SMEs' supply chain resilience. More precisely, the current study explored the effect of supply chain partner relationships on SME supply chains' ability to recover from turbulent situations. To the best of the author's knowledge, the present study is the first study of its sort conducted in Sri Lanka, which focuses on the impact of outsourcing in supply chain resilience of SMEs.

The information gathered by 114 SMEs was used in this study to meet its objectives. A stratified random sample technique was used to find SMEs. A closed-ended online questionnaire was distributed from May 1st through August 14th, 2021. The administered questionnaire had a response rate of 74.37%. The data set was analyzed using regression analysis and correlation analysis to achieve the study's primary goals after evaluating the validity and reliability of the gathered data.

The findings of the present study show that the conceptual model of the study holds together quite well. Relationships have a critical role in supply chain resilience, as described throughout the paper. All the independent variables (outsourcing, collaboration) evaluated in this study had a positive relationship with the dependent variable (supply chain resilience), according to the statistical findings. The study also investigated the relationship between each independent variable and the dependent variable. All the hypotheses were confirmed. The study's major goal is to determine how

outsourcing, collaboration, and supply chain resilience are interrelated in SMEs during the pandemic era. In order to achieve this main objective, four sub-objectives were identified, and their specifics are summarized below.

The first sub-research objective was to determine the association among collaboration and supply chain resilience in SMEs during the Coronavirus pandemic. The findings discovered that there was a positive correlation among collaboration and supply chain resilience. Overall, the findings of this study support patterns found in post-disaster studies about the importance of strong collaborative partnerships. This finding also supports the social capital theory, which states that a company's personal contacts and networks, both within and beyond the company, have a substantial impact on the success of the company.

The second sub-research objective was to ascertain the relationship between outsourcing and supply chain resilience in SMEs during COVID-19 pandemic. According to the findings of the current study, there is a clear relationship between outsourcing and supply chain resilience of SMEs. As a result, the current study suggests SME owners/entrepreneurs to participate in strategically selected outsourcing activities to enhance the resilience of supply chains during challenging times.

The third sub-research objective was to ascertain the impact of collaboration on supply chain resilience in SMEs during COVID-19 pandemic. The current study's researchers used multiple regression analysis as an analysis approach to accomplish this sub-objective. Thereby, the current research suggests that collaboration has a substantial impact on the supply chain resilience of SMEs. This result is in connection with previous studies that identified collaboration to be a key element of supply chain resilience (Cao and Zhang, 2011; Scholten and Schilder, 2015).

The fourth sub-research objective was to establish the impact of outsourcing on supply chain resilience in SMEs during COVID-19 pandemic. Multiple regression analysis was used by the researchers in the current study to investigate the impact of outsourcing on supply chain resilience in SMEs. The findings show that outsourcing has a significant positive impact on SMEs' supply chain resilience in Sri Lanka during the current epidemic.

The research has a number of practical implications for small and medium enterprises, and it can assist managers in improving supply chain resilience. Overall, significant empirical findings are shown in this study. Future studies will be proficient in gaining better understand the interplay between

outsourcing and collaboration on SME supply chain resilience, which has not been adequately addressed in the literature thus far (Bak et al., 2020). The study's empirical contribution can help SMEs in Sri Lanka improve their supply chain resilience. The researchers of this study believe that the findings of this study give a good platform for future research in this field.

Managerial Implications

The current study focuses mostly on the SME sector. During the COVID-19 pandemic, this research project helped to establish that supply chain collaboration and outsourcing are critical to enhancing supply chain resilience in Sri Lankan SMEs. In other terms, the importance of relationships along the supply chain is emphasized in this study. As a result, managers can implement appropriate policies and procedures to promote outsourcing and collaboration in order to strengthen supply chain resilience. As a result, the findings of this study will aid in the management of outsourcing partners and collaborators in a way that considerably improves supply chain resilience in SMEs. Furthermore, this research can be used as a guide to improve the preparedness of SME supply chains in the event of an unanticipated future catastrophe. Because the education levels of the SMEs employees interviewed are generally good, they will be able to implement the study findings in real-life business scenarios on resilience.

It is advised that supply chain resilience be explored further, based on the findings and ideas for future research offered here, considering its importance in dealing with emergent, turbulent, and difficult market conditions, as well as an unstable environment. This is related to outsourcing functions, which is a trending subject at the moment. In order to manage risk in the supply chain in the current climate, managers are well aware of the need to move away from traditional/conventional approaches and plans. As a result, businesses should take advantage of the current crisis, which has resulted from the turbulence, to not only overcome disruptions but also to become more competitive in a dynamic market. The current epidemic might be considered as a trial or test run in which SMEs can examine their situation (i.e., strengths, vulnerabilities, and so on) in ways that would not otherwise be possible. Overall, the research will assist supply chain managers in lowering ambiguity in decision-making and associated risks during these hard times. Supply chain managers will also be able to plan for and respond to supply chain disruptions. Finally, in the continuing COVID-19 pandemic and future pandemics of similar intensity, the current analysis emphasizes the necessity of resilience in supply chain disruption management.

Recommendation for Future Researchers

Several recommendations for further research can be made in light of the findings stated above. The researchers of the current study concentrated solely on quantitative methodologies to fulfill the study's objective. As a result, future researchers can concentrate on qualitative approaches or a mixture of qualitative and quantitative approaches to help develop understanding. Conducting several case studies in manufacturing firms within a single sector could be a possibility for future study in terms of qualitative techniques. It would be helpful to verify whether the strategies discussed throughout the research are relevant, efficient, and sufficient to ensure supply chain resilience in SMEs. Future scholars could also do a comparison study across countries to uncover potential cultural, economic, and environmental constraints and limitations. Future researchers can also use longitudinal studies to evaluate the advancement of supply chain resilience techniques, as Jüttner and Maklan (2011) has suggested. Another research opportunity is to undertake a systematic literature review that considers both pre-pandemic supply chain resilience techniques and post-pandemic supply chain resilience strategies. Furthermore, at the data analysis stage, the current study had a poor R squared value of 27.1%. As a result, the researchers suggest that more research be done into various resilience measures that can be employed to enhance SME supply chain resilience.

Several times in the previous two decades, more empirical, event-based, and a smaller amount of conceptual supply chain resilience research has been urged. As a result, academics will be able to perform more study during the pandemic period. Future scholars can use qualitative research methodologies to further investigate the findings. In this case, interviews can be used to test the strategies found out in this study. To justify supply chain resilience performance and capability measures with reasonable evidence, more rigorous and exploratory empirical research is required.

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