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Factors Impacting SME Business Resilience Post-COVID-19

Kerry Brown [1], Ferry Jie [1], Thi Le [2,3,*], Jalleh Sharafizad [1], Fleur Sharafizad [1] and Subhadarsini Parida [4]

[1] School of Business and Law, Edith Cowan University, 270 Joondalup Drive, Joondalup 6027, Australia
[2] Business School, Murdoch University, 90 South Street, Murdoch 6150, Australia
[3] CRTRAD, Thuongmai University, Hanoi 10000, Vietnam
[4] UniSA Business, University of South Australia, Adelaide 5001, Australia
* Correspondence: thi.le@murdoch.edu.au

Abstract: The ability of an organization to respond to a crisis with agility is vital for business leaders to maintain business continuity. Our paper examined how business owners responded to the challenges caused by the pandemic. Using online surveys for data collection, we investigated a critical agility issue of supply chain risks through understanding the interrelationship of various business capability factors. Partial least squares path modeling (PLS-PM) was applied to a sample of 220 participants who were owners of micro, small, and medium businesses in Western Australia. The findings showed that the businesses' efficiency, financial strength, and flexibility in sourcing affected the businesses' supply chain risks negatively. More support for labor productivity, asset utilization, waste elimination, financial reserves, portfolio diversification, and credit access needs to be introduced to enhance the resilience of the business supply chain. This paper is novel, as we used the data collected in Western Australia, where the SMEs were still affected by the global supply chain disruption but lacked protracted lockdowns, as had occurred nationally and globally during the COVID-19 period.

Keywords: COVID-19 pandemic; business resilience; supply chain risks; business capabilities; SMEs

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1. Introduction

The COVID-19 pandemic significantly affected the global economy and financial markets. Severe income reduction, increased unemployment, and disruptions in transportation services, manufacturing, and supply chains were experienced globally [1–3]. COVID-19 caused extreme disruptions and restricted the flow of goods and services impacting business performance [4], thereby reducing SMEs' efficiency and survival.

COVID-19 has dramatically changed the economic conditions in which micro, small, and medium businesses operate and compelled these businesses to rethink their operations in response to supply chain disruptions, customer demand shifts, and employee health threats. The ability of an organization to respond to a crisis is vital to maintain business continuity [5]. We argue it is critical to gain an insight into how businesses have been affected, with a particular focus on the concerns identified by business owners. This knowledge will aid in the development of public policy responses, business capacity building, and employee upskilling to improve business recovery and resilience in times of crisis.

The COVID-19 pandemic is challenging for many businesses, but its impact on SMEs is particularly devastating [6]. Previous research on the effects of disasters on SMEs and the strategies developed to cope with such vulnerability concentrated on natural disasters, such as floods or earthquakes, only. The current crisis caused by the COVID-19 pandemic differs from other crises due to the interruption of economic activities in widespread geographic areas with unpredictable implications [7].

Our paper aims to identify and examine the impact of COVID-19 on micro, small, and medium businesses and identify the ways in which businesses may build and increase business resilience. Given the global nature of the pandemic, the relationship between businesses and their goods and services is a new and critical concern. Hence, this paper highlights the

interrelationships of different businesses' capabilities with their level of supply chain risks. Based on the findings, we identify a set of policies for business owners and policymakers to increase supply chain resilience. This paper is unique, as we use data collected in Western Australia, where the SMEs were still affected by the global supply chain disruption but avoided the severe impact of protracted lockdowns during the COVID-19 period.

2. Literature Review

Since the determination of COVID-19 as a pandemic, the academic community has been highly responsive to conducting research to understand the impact of the global phenomenon. The literature review confirmed that recent studies concentrated on the effects of COVID-19 on SMEs caused by the impending economic distress that occurred during the pandemic and the strategic management policies to recover from the crisis [8–15]. Different business aspects affected the SMEs in the COVID-19 pandemic, as SMEs varied in terms of business nature, geographic location, national economic conditions, business environmental factors, and business adaptive and innovative capability during the crisis period.

We used VOS viewer software to investigate significant research works on SMEs in the context of the COVID-19 pandemic. VOS viewer forms data clusters based on a similar research theme. Papers associated with a cluster have strong relations with other articles within the cluster while having limited linkage with the publications of different clusters [16]. As the papers within one cluster are categorized based on similarity, clustering is considered an effective tool for exploring different dimensions of research topics existing in the literature. A total of eight clusters were found, and only related items were mapped. Different colors represent different clusters, and the circle represents the higher weight of an item. More details are presented in Figure 1.

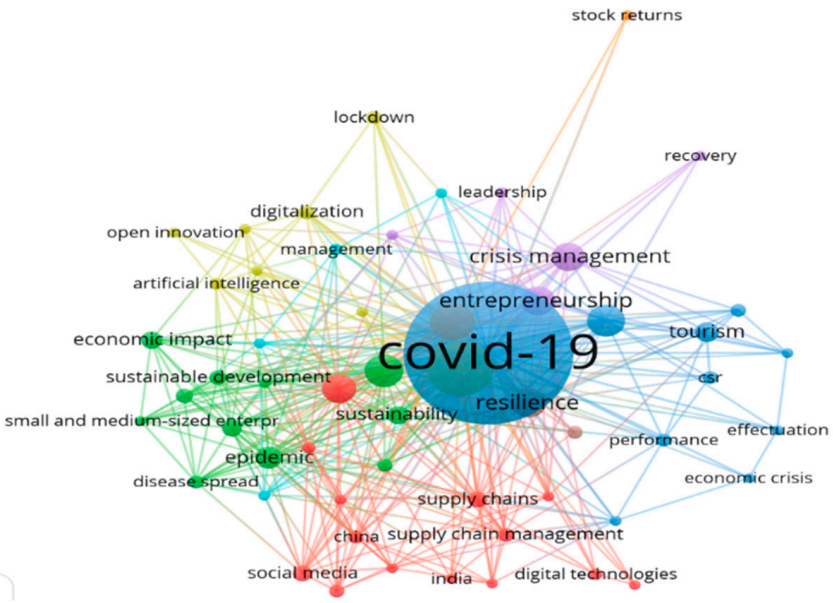

Figure 1. Research on COVID-19 clusters generated by the VOS viewer.

The first cluster focused on different solutions to support SMEs in recovery from the COVID-19 pandemic. In this cluster, papers concentrated on various subthemes of recovery solutions, such as digital technologies, disaster management, innovation, knowledge management, social networking, supply chain resilience, supply chain management, and structural equation model. The second cluster focused on the economic impact of the virus and disease spread on SMEs, prospects, and sustainable development of business. The third cluster focused on performance and risk management and business model innovation under the impact of the COVID-19 crisis. The fourth cluster concentrated on using artificial intelligence, digital transformation, digitalization, e-commerce, and other

solutions introduced to SMEs to adapt to the lockdown situation. The fifth cluster focused on crisis management, strategies, leadership, and recovery topics. The sixth cluster focused on dynamic capabilities. The seventh cluster focused on the pandemic's effect on the stock returns of the companies. The eighth cluster focused on resilience and supply chain issues.

Our findings indicate that papers in the first cluster dominated the research topics on solutions for SMEs to cover the impacts of the COVID-19 pandemic. The papers focused on various factors affecting SME recovery, such as digital technologies, management, social networking, and business resilience. These factors had an intercorrelation and needed to be investigated carefully to bring a comprehensive set of solutions for businesses to build up their resilience for the COVID-19 pandemic recovery. Overall, the SMEs struggled with operational interruption, supply chain disruption, shortage of internal capital to cover the operating expenditure, insolvency risks, and the scarcity of government support packages during the long-term lockdown and closed border period [17].

In the context of developed economies, ref. [2] identified the detrimental effects of COVID-19 on SMEs' entrepreneurial credit in the United Kingdom. In addition, many studies have reported the financial vulnerability of SMEs in the United States [6,18]. SMEs in several sectors, such as retail, hospitability, food services, and entertainment services, have been affected significantly by COVID-19 [19]. The strict lockdown due to the outbreak of COVID-19 in China and other countries in Asia, home to the majority of manufacturing factories, resulted in severe supply disruptions of finished products. Most SMEs that rely on suppliers from these countries have experienced supply chain vulnerability. When manufacturing recovered and the products started being delivered from China, the supply chain of SMEs was impacted by other factors, such as an increase in freight due to the expense of flights and containers [20]. COVID-19 led to the total shutdown or delay of travel, competitive sports, and mega-events, such as the Olympic Games and Football Championships, to avoid massive gatherings [21], consequently affecting the sports' hospitality and tourism industry. As the travel and tourism industry, hospitality, and food services industry were often operated by small tour operators, car rental companies, restaurants, and accommodations (hotels and motels), the negative effect led to a significant unfavorable impact on SMEs in these sectors [22]. Previous research showed that SMEs, unlike big corporations, were under capacity to establish the conditions for a quick recovery from a crisis [23]. This outcome is because SMEs have the disadvantages of being small and having insufficient resource capacities. Currently, SMEs are reacting to COVID-19's economic impact in various ways, such as enhancing business resilience by having more than one supplier, uplifting their digital capabilities, including online sales options, improving employee wellbeing, pivoting or downsizing the business [20]. One Vietnamese restaurant in Melbourne, Australia, has shifted its business from selling food to selling face masks [24]. Business resilience is the key factor that allows SMEs to take advantage of the opportunities in chaos and survive in uncertain times [25].

Resilience is critical in entrepreneurial crisis management, since it helps understand how organizations adapt to or resist change [26]. As a result, researchers and politicians are paying close attention to the ways of building business resilience. The concept of resilience was first introduced in ecological literature [27] and has developed in the business context through the growth of a heuristic model based on complex systems and viewed as an adaptive cycle [28]. According to [26], resilience refers to the capacity of an entity to accommodate change and reorganize while preserving the same functionality, structure, identity, and feedback. However, the definition of resilience based on one discipline may be oversimplified and lack comprehensive acknowledgment of different contexts to which it can be applied [29]. Supply chain resilience is developed using the foundations of many disciplines, including ecology [30–32], psychology [33–35], sociology [36], risk management [37,38], and network theory [39]. Ref. [40] proposed two components of the resilience concept. The first construct was vulnerabilities—the fundamental factors making a business vulnerable to disruptions. The second construct was capabilities, which allowed a company to forecast and deal with disturbances.

Previous literature investigated how supply chains could adapt efficiently to globally disruptive events [41]. Ref. [42] created a dynamic capabilities framework to explore the methods and sources for wealth creation in the context of rapid technology movement. The dynamic capabilities were defined as the enterprise's competencies to integrate, construct, and reorganize internal and external abilities to accommodate a quickly changing environment. Ref. [43] proposed a method to generate an optimal disruption management strategy consisting of levels of flexibility considering mitigation and contingency action costs. Other researchers conducted studies on the variables that contributed to supply chain disruptions and traits that assisted firms in preventing and managing disorders [44–49]. Resilience is a dynamic, changing concept. Refs. [48,50] emphasized enhancing communication, distributed authority, enthusiasm for the mission, self-restraint, and flexibility conditioning to promote greater flexibility and redundancy.

In more recent research, ref. [51] reviewed the supply chain resilience notion within a concept mapping framework to deliver conceptual clarity focused on supply chain resilience definitions, critical elements, and empirically determined managerial practice. The results indicated that supply chain resilience was based on three significant factors: phases of resilience, resilience strategies, and resilient capabilities. Ref. [52] introduced a conceptual framework on three forms of resilience: engineering, ecological and evolutionary, and their connections with four phases of supply chain resilience—readiness, response, recovery, growth, and renewal—using a complex adaptive systems perspective. Ref. [53] extended the research by creating a multi-level framework, which enabled the entity to examine resilience at various analysis levels, such as individual, organizational, and inter-organizational levels. Ref. [54] performed a content analysis of 39 papers to identify the existing definitions of supply chain resilience decisions and developed a comprehensive framework, which addressed four critical elements of supply chain resilience: focus event, adaptive response, speed, and performance level. Ref. [55] examined the post-disruption stage by interviewing six company directors and executives in Taiwan to propose an effective post-disruption recovery management process in the supply chain, consisting of disruption discovery, disruption recovery, and supply chain learning and redesign. Ref. [20] found that businesses must innovate and apply creativity to make challenges become opportunities to recover from the current COVID-19 pandemic and sustain the business in the long run. The higher resilience levels among SMEs would result in a better performance in the COVID-19 crisis. The firms that previously received technical or managerial training were found to be better prepared to build business resilience [5]. Ref. [56] investigated the factors that affected the routinizing of building resilient start-ups based on a qualitative cross-case analysis and found the negative impact of start-up-specific context factors on this process. Businesses respond to disruptive events in various ways depending on the enterprise's capabilities and the conflicting or synergistic capabilities of the supply chain members [44,57].

The primary goal of resilience was to deal with temporary disruptive events. Resilience was then defined as the ability to plan and build a system that could adjust to interruptions while maintaining command over the network and structure of the operation [58]. Thus, the manager's focus was to develop a portfolio of capabilities that could balance the inherent vulnerabilities in the supply chain, resulting in balanced resilience, which was expected to boost company performance [40]. For this purpose, many indicators were necessary to include in the supply chain and business operating system to make it resilient. A content analysis of prior literature identified a portfolio of supply chain resilience characteristics, including flexibility in sourcing, flexibility in order fulfillment, capacity, efficiency, visibility, adaptability, recovery, dispersion, collaboration, organization, and financial strength.

Although the studies on the impacts of COVID-19 on SMEs have attracted the attention of academicians and practitioners, very little research focuses on the SMEs' crisis and crisis recovery strategy based on their practical experiences. Moreover, refs. [35,59] indicated that future research should clarify the factors that make organizations resilient to external shocks [60]. Thus, our paper examines the current state of COVID-19 impacts on SMEs, identifying the

links between the vulnerabilities and capabilities to obtain business-balanced resilience, with a focus on supply chain resilience. It proposes recommendations to public policymakers to improve business supply chain resilience to recover from the COVID-19 pandemic.

3. Data and Methodology

3.1. Data and Measures

The study involved analyzing the research literature, reports, and a survey of Western Australia micro, medium, and small businesses to investigate the interrelation of different business capability factors with their supply chain risks. A questionnaire was developed based on factors identified from the existing literature and according to the input of various stakeholders (see supplementary materials). Our sample consisted of participants who were owners of micro, small, and medium-sized businesses operating in Western Australia. The data were collected during 2020 and 2021. The researchers used a series of skills-based workshops for SMEs, which were hosted by regional and urban business associations to raise awareness of the study. LinkedIn was also used to alert WA businesses to the survey.

An invitation was provided to Western Australian businesses to complete the anonymous online questionnaire. Two hundred and twenty completed questionnaires were received and analyzed.

The questionnaire was developed to explore business size according to the number of employees, turnover, business type, the current state of business under COVID-19 impacts, and business resilience. The questionnaire comprised three sections. The first section dealt with general information, such as the number of employees, annual turnover level, business type, standard industrial classification (SIC) sector, the firm's age, participant's gender, and postcode.

The second section identified the impact of COVID-19 on business operations. Businesses were asked to evaluate the change in staff, turnover, profit, and supply chain disruption due to COVID-19 and forecast their performance post-COVID-19.

The third section assessed the applicants' supply chain risks and capabilities, which enabled participants to overcome disruptions and seize opportunities for competitive advantage. Participants were asked about the supply chain risks faced during the COVID-19 pandemic. All capability factors were designed by using the information obtained from interviews with participants and a literature review, as supported by [40,61], including flexibility in sourcing, flexibility in order fulfillment, capacity, efficiency, visibility, adaptability, recovery, dispersion, collaboration, organization, and financial strength. For each statement, the participants were asked to indicate their agreement or disagreement on a five-point Likert scale, ranging from 1 (strongly agree) to 5 (strongly disagree). Participants could choose "not applicable" if they did not have personal knowledge of the subject.

Table 1 provides the general information collected from the respondents. Business size measured by employment and annual turnover was presented. Against the Australian Bureau of Statistics (ABS) definition of a small business as employing fewer than 20 employees, small businesses accounted for nearly 91.7 percent of survey participants. Most Western Australian businesses who completed the survey were sole traders with no employees (37.5 percent). Microbusiness (1–4 employees) accounted for 29.2 percent; small businesses (5–19 employees) and medium businesses (20–199 employees) accounted for 25 percent and 8.3 percent, respectively. Against the Australian Tax Office (ATO) definition of a small business (a turnover of less than AUD 10 million), small businesses accounted for 100 percent of survey attendants. Nearly half of the businesses in the survey had a turnover of less than AUD 200,000. A total of 12.5 percent of businesses had a turnover between AUD 200,000 and AUD 750,000. Twenty-five percent of businesses had a turnover between AUD 750,000 and AUD 1.5 million. Only 8.3 percent of businesses had a turnover between AUD 1.5 million and AUD 5 million. Very few businesses had a turnover higher than AUD 5 million (4.2 percent). A total of 20.8 percent of businesses were from the "other" category of the services sector; 16.7 percent were from the Retail Trade and Professional, Scientific, and Technical Services sector, followed by Health Care and Social Assistance (12.5 percent). The remaining participants were from Mining, Wholesale Trade, Accommodation, and

Food Services, Financial and Insurance Services, Administrative and Support Services, Education and Training, and Arts and Recreation Services. The most common business form was the company (45.8 percent), followed by sole traders (37.5 percent). Half of the attendants were young businesses, less than five years of age.

Table 1. Survey sample description.

	%		%
Business Forms		**SIC Sector**	
Sole traders	37.5	A: Agriculture, Forestry, and Fishing	0.0
General partnership	0	B: Mining	4.2
Limited partnership	0	C: Manufacturing	0.0
Incorporated limited partnership	0	D: Electricity, Gas, Water, and Waste Services	0.0
Company	45.8	E: Construction	0.0
Trust	8.3	F: Wholesale Trade	4.2
Charitable company limited by guarantee	4.2	G: Retail Trade	16.7
Social enterprise	0	H: Transport, Postal, and Warehousing	0.0
Other	4.2	I: Accommodation and Food Services	4.2
Number of employees		J: Information Media and Telecommunications	0.0
0 (sole trader/owner)	37.5	K: Financial and Insurance Services	4.2
1–4 (micro)	29.2	L: Rental, Hiring, and Real Estate Services	4.2
5–19 (small)	25	M: Professional, Scientific, and Technical Services	16.7
20–199 (medium)	8.3	N: Administrative and Support Services	4.2
Annual turnover		O: Public Administration and Safety	0.0
0–less than 75,000	29.2	P: Education and Training	4.2
75,000–less than 200,000	20.8	Q: Health Care and Social Assistance	12.5
200,000–less than 750,000	12.5	R: Arts and Recreation Services	4.2
750,000–less than 1.5 m	25	S: Other Services	20.8
1.5 m–less than 5 m	8.3	**Firm's age**	
5 m–less than 10 m	4.2	0–less than 5 years	50
10 m or more	0	5–less than 10 years	20.8
		10–20 years	12.5
		20 years or more	16.7

3.2. Regression Model

We used Smart PLS 3 software to analyze the obtained data due to the ability of the model to investigate the association among all latent constructs simultaneously while taking into account the measurement errors in the structural model [62]. Partial least squares path modeling (PLS-PM) was first introduced by Wold (1975) to assess high-dimensional data in a low-structure environment. Over the last decade, PLS-PM has been the predominant estimator for structural equation models in the various fields of business administration research, such as strategy, marketing, operations management, human resource management, finance, tourism, and family business. PLS-PM was selected as: (i) the model was found to fit the purpose of our research, which is explanatory; and (ii) PLS-PM can produce estimates even for very small sample sizes [63].

The scholars' argument about using PLS_PM, such as the model, is inconsistent for latent variables and lacks the overall model fit test [64]. This has encouraged the development of several improvements to the PLS-PM model. The overall fit of the PLS-PM model can now be assessed by two approaches: (i) by a bootstrap-based test for overall model fit [65] and (ii) by measures of overall model fit, such as SRMR [66]. Consequently, PLS-PM has evolved into a full-fledged SEM estimator capable of dealing with reflective, causal–formative, and composite measurement models. Furthermore, it can be used in research, which is confirmatory, explanatory, exploratory, descriptive, or predictive [67].

The PLS_PM was used to test the different capabilities related to the supply chain risks of the businesses. The investigation of these capabilities will allow the businesses to develop and build up their skills to overcome the disruptions. Supply chain risks consist of a number of risks reported by the participating businesses managers, including shortage of supply

and extended lead time (Q1), slow ramp-up after factories open (Q2), logistical bottlenecks as a result of rush supplies (Q3), insufficient preparedness to respond to disruption and limited applicability of existing plans (Q4), short-term peaks in certain categories (Q5), reduction in demand in other categories (Q6), short-term peak in transportation demand followed by surplus capacity in transportation (Q7), the need to speed up online and IT capability (Q8), the need to focus on ensuring supplies and receiving priority from disrupted suppliers (Q9), seeking inventory and improved terms with suppliers as part of coping with (financial) pressure on the company (Q10). Table 2 provides the supply chain risks and capability factors employed in the regression testing model.

Table 2. Supply chain risks and capability factors.

Supply Chain Risks	Definition		Selected Risks Reported by the Participating Businesses	Capability Factor	Definition		Subfactors
Supply risks	Supply disruptions resulting from plant closures	Q1	Shortage of supply and extended lead times	Flexibility in Sourcing	Ability to quickly change inputs or the mode of receiving inputs	C1.1 C1.2 C1.3 C1.4	Multiple uses Modular product design Supplies contract flexibility Multiple sources
		Q2	Slow ramp-up after factories open	Flexibility in Order Fulfillment	Ability to quickly change outputs or the mode of delivering outputs	C2.1 C2.2 C2.3	Alternate distribution channels Delayed commitment/Production postponement Order and job reallocation
		Q3	Logistical bottlenecks as a result of rush supplies	Capacity	Availability of assets to enable sustained production level	C3.1 C3.2	Redundancy Reserve capacity
		Q4	Insufficient preparedness to respond to disruption and limited applicability of existing plans	Efficiency	Capability to produce outputs with minimum resource requirement	C4.1 C4.2 C4.3	Labor productivity Asset utilization Waste elimination
Demand risks	Demand spikes lead to product shortages and logistical bottlenecks	Q5	Short-term peaks in certain categories	Visibility	Knowledge of the status of operating assets and the environment	C5.1 C5.2 C5.3	Information technology Product, equipment, and people visibility Business intelligence gathering
		Q6	Reduction in demand in other categories	Adaptability	Ability to modify operations in response to challenges or opportunities	C6.1 C6.2 C6.3 C6.4	Strategic gaming and simulation Seizing advantage from disruptions Alternative technology development Learning from experiences
		Q7	The short-term peak in transportation demand followed by surplus capacity in transportation	Recovery	Ability to return to normal operational state rapidly	C7.1 C7.2 C7.3	Crisis management Resource mobilization Consequence mitigation
		Q8	Need to speed up online and IT capability	Dispersion	Broad distribution or decentralization of assets	C8.1 C8.2 C8.3	Decentralization of key resources Distributed capacity and assets Dispersion of market
Control Risks	Need to engage suppliers in crisis response	Q9	Need to focus on ensuring supplies and receiving priority from disrupted suppliers	Collaboration	Ability to work effectively with other entities for mutual benefit	C9.1 C9.2 C9.3 C9.4	Collaborative forecasting Customer management Communications Product life cycle management
		Q10	Seeking inventory and improved terms with suppliers as part of coping with (financial) pressure on the company	Organization	Human resource structures, policies, skills, and culture	C10.1 C10.2 C10.3	Accountability Cross-training Culture of caring
				Financial strength	Capacity to absorb fluctuations in cash flow	C11.1 C11.2 C11.3	Financial reserve Portfolio diversification Credit access

4. Results

4.1. Key Findings–Impacts of COVID-19

During the COVID-19 pandemic, for the whole financial year (1 July 2019–30 June 2020), 62.5 percent of businesses decreased less than 5 percent of their full-time staff. A total of 12.5 percent of businesses decreased from 5 percent to 10 percent full-time staff, and 16.7 percent of businesses experienced a decrease in full-time staff from 10 percent to 20 percent. Few businesses decreased from 30 percent to 50 percent full-time staff (4.2 percent) and more than 50 percent full-time staff (4.2 percent). Refer to Table 3.

Table 3. Business decreases in full-time staff in 2019–2020.

Decreases in Full-Time Staff	%
Less than 5%	62.5
5% to less than 10%	12.5
10% to less than 20%	16.7
20% to less than 30%	0.0
30% to less than 50%	4.2
50% or more	4.2
Total	100.0

The majority of businesses estimated they would grow slightly or remain broadly static in their turnover, market share, staff level, profits, and exports. Notably, 7.5 percent of businesses estimated a sharp decline in revenue due to COVID-19; 17 percent reported a slight decrease; 16 percent remained broadly static; 36.3 percent grew slightly; and 22.5 percent grew sharply. Similar patterns were reported for businesses' market share, profit, and staffing levels. Most businesses believed they could remain broadly static in exports (73 percent) (see Table 4).

Table 4. Business objectives regarding turnover, market share, staffing levels, profit, and exports during 2020–2021.

	Sharply Reduce	Slightly Reduce	Remain Broadly Static	Grow Slightly	Grow Sharply
Turnover	7.5%	17.0%	16.0%	35.8%	23.6%
Market Share	1.9%	13.5%	44.2%	24.0%	16.3%
Staffing Levels	3.8%	13.5%	44.2%	30.8%	7.7%
Profits	3.8%	16.0%	26.4%	36.8%	17.0%
Exports	5.8%	9.6%	72.1%	7.7%	4.8%

A total of 93.2 percent of businesses were confident that their business would survive the COVID-19 crisis. Of these, 54.9 percent believed that their business would survive and grow, and 31.4 percent believed their business would survive and remain stable. A total of 6.9 percent of businesses believed their business would downsize, and 6.8 percent thought they would have to sell or discontinue their business (Table 5).

Table 5. Business focus in the financial year 2020–2021.

Business Focuses	%
Surviving and growing	54.9
Surviving and stability	31.4
Surviving and downsizing	6.9
Selling the Business	1.0
Discontinuing the Business	5.9

The greatest challenges facing businesses were demand risks (demand spikes leading to product shortages and logistical bottlenecks) (28 percent) and supply risks (supply disruptions resulting from plant closures) (19 percent), followed by the shortage of financial reserves to cover most potential needs (17 percent) and others (18 percent), such as border restriction, shortage of staff, extreme weather conditions, difficulty in connecting with the existing and potential customers. (Table 6).

Table 6. The greatest challenges of SME businesses.

Greatest Challenges	%
Supply risks (supply disruptions resulting from plant closures)	19
Demand risks (demand spikes leading to product shortages and logistical bottlenecks)	28
Control risk (need to engage suppliers in crisis response)	10
Shortage of financial reserves to cover most potential needs	17
Limited access to credit	8
Others	18

4.2. Model Fit

A convergent validity test was carried out and critically analyzed, including Cronbach's alpha, average variance extracted (AVE), and composite reliability (CR). The results are shown in Table 7. Cronbach's alpha was more than 0.9, which fulfilled the value recommended by [68]. For the AVE threshold, the AVE should exceed 0.5 [69]. In our research, the AVEs were in the range of 0.728 and 0.917 and thus were acceptable. Furthermore, the CR values were higher than 0.9, which showed consistency with the value suggested by [69].

Table 7. Construct reliability and validity.

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Adaptability	0.920	0.923	0.944	0.807
Capacity	0.909	0.910	0.956	0.917
Collaboration	0.931	0.932	0.951	0.829
Dispersion	0.932	0.933	0.957	0.880
Efficiency	0.921	0.922	0.950	0.863
Financial Strength	0.930	0.931	0.955	0.876
Flexibility in Order Fulfillment	0.913	0.916	0.945	0.852
Flexibility in Sourcing	0.943	0.943	0.959	0.853
Organization	0.927	0.929	0.953	0.872
Recovery	0.936	0.937	0.959	0.887
Supply Chain Risks	0.958	0.959	0.964	0.728
Visibility	0.926	0.926	0.953	0.870

We used the Fornell–Larcker test [70] to examine the discriminant validity. The Fornell–Larcker test has been used widely in research publications in the management information systems area. As provided in Table 8, most of the constructs exhibited sufficient or satisfactory discriminant validity, where the square root of AVE (diagonal) was larger than the correlations (off-diagonal) for all reflective constructs.

The R^2 measures the goodness of the structural model. Similarly, ref. [69] implied that the coefficient of determination and the level of significance of the path coefficients (beta values) could be measured by R^2. The R^2 of the proposed model was 0.828, suggesting that 82.8 percent of the variance of supply chain risks could be explained by adaptability, capacity, collaboration, dispersion, efficiency, financial strength, flexibility in order fulfillment, flexibility in sourcing, organization, recovery, and visibility. Further statistical significance assessment was undertaken by calculating the path coefficients and running the bootstrap analysis. Table 9 shows the path coefficients of the structural model and statistic test. The

capabilities, including efficiency, financial strength, and flexibility in sourcing, negatively correlated with supply chain risks; the beta values were −0.25, −0.229, and −0.371, respectively. Thus, the associations of efficiency, financial strength, and flexibility in sourcing with the supply chain risks were confirmed.

Table 8. Discriminant validity (Fornell–Larcker criterion).

	Adaptability	Capacity	Collaboration	Dispersion	Efficiency	Financial Strength	Flexibility in Order Fulfillment	Flexibility in Sourcing	Organization	Recovery	Supply Chain Risks	Visibility
Adaptability	0.898											
Capacity	0.839	0.957										
Collaboration	0.884	0.788	0.911									
Dispersion	0.910	0.795	0.934	0.938								
Efficiency	0.888	0.877	0.829	0.836	0.929							
Financial Strength	0.839	0.832	0.822	0.827	0.804	0.936						
Flexibility in Order Fulfillment	0.875	0.875	0.825	0.838	0.866	0.808	0.923					
Flexibility in Sourcing	0.845	0.802	0.789	0.808	0.840	0.794	0.877	0.924				
Organization	0.860	0.791	0.889	0.871	0.779	0.828	0.831	0.800	0.934			
Recovery	0.898	0.824	0.905	0.910	0.846	0.862	0.832	0.830	0.892	0.942		
Supply Chain Risks	−0.824	−0.804	−0.792	−0.798	−0.843	−0.827	−0.832	−0.865	−0.809	−0.836	0.853	
Visibility	0.917	0.873	0.859	0.853	0.924	0.812	0.886	0.827	0.820	0.860	−0.833	0.933

Table 9. Path coefficients.

Relationship	Std. Beta	Std. Error	t-Value	Decision
Adaptability -> Supply Chain Risks	0.144	0.116	1.243	Not supported
Capacity -> Supply Chain Risks	0.052	0.100	0.522	Not supported
Collaboration -> Supply Chain Risks	0.071	0.121	0.587	Not supported
Dispersion -> Supply Chain Risks	0.028	0.117	0.238	Not supported
Efficiency -> Supply Chain Risks	−0.250	0.133	1.871 *	Supported
Financial Strength -> Supply Chain Risks	−0.229	0.099	2.312 **	Supported
Flexibility in Order Fulfillment -> Supply Chain Risks	−0.024	0.112	0.215	Not supported
Flexibility in sourcing -> Supply Chain Risks	−0.371	0.123	3.016 ***	Supported
Organization -> Supply Chain Risks	−0.159	0.109	1.460	Not supported
Recovery -> Supply Chain Risks	−0.113	0.122	0.927	Not supported
Visibility -> Supply Chain Risks	−0.123	0.154	0.797	Not supported

Note: This table shows the results of the structural model using partial least square (PLS) version 3. The R-square value is 0.828, and the sample size is 120. The signs *, **, *** denote significance at 10, 5, and 1%, respectively.

5. Discussion and Conclusions

This paper employed a quantitative survey to explore the impact of COVID-19 on micro, small, and medium businesses and to identify the link of business capability factors with their supply chain risks. The steps to support businesses to build and increase business resilience, with the focus on business supply chain resilience, were then able to be identified. The online survey was distributed to businesses in Western Australia using Qualtrics software, and the survey hard copies were distributed to workshop participants in regional and urban areas supported by business associations. The final sample consisted of 220 respondents.

The findings from our research indicated some key insights.

First, the majority of businesses were confident that their business would survive and grow or remain stable. This finding did not align with research findings from the

UK [2] and the US. The greatest challenges facing businesses were demand and supply risks, followed by the shortage of financial reserves to cover most potential needs, and others, such as border restrictions, lack of staff, extreme weather conditions, difficulty in connecting with existing and potential customers. Additionally, the most severe risk causing problems for SMEs was the need to speed up online and IT capability. Relatively few businesses estimated a sharp decline in revenue, market share, profit, and staffing levels due to the COVID-19 pandemic.

Second, consistent evidence was found for the negative association between businesses' supply chain risks and businesses' capabilities that enabled the firms to overcome disruption and seize opportunities for competitive advantage. Businesses' efficiency, financial strength, and flexibility in sourcing were found to have a significantly negative relationship with the businesses' supply chain risks. The findings highlighted the importance of these factors in mitigating supply chain risks and building supply chain resilience. The findings are in line with the study of [71], which found the importance of preferential bank policies in the survival and development of SMEs during the COVID-19 pandemic.

The survey results provided several novel and critical insights for policymakers and business owners when designing policies and strategies for businesses to recover from the COVID-19 pandemic. Overall, policymakers and business owners need to be aware that more support in terms of labor productivity, asset utilization, waste elimination, financial reserves, portfolio diversification, credit access, building flexibility in sourcing by undertaking multiple uses, modular product design, supply contract flexibility, and various alternative sources need to be introduced. Government policy initiatives in the form of financial recovery packages and flexible financial options for tax liability are a start to the recovery.

Our findings indicate that, post-COVID-19, businesses will require significant restructuring of their supply chains to include localized 3D printing, automation, blockchain technologies, and strategic alignment to mitigate the risks of major disruption of their supply chains in the future. Ref. [72] acknowledges the importance of a 3D strategy to support resilience in business operations. Our research into COVID-19 supply chain disruptions identified the need for technological responses to local production and sourcing adaptation, and we contend that 3D printing provides a salient technological addition to this local supply issue. Digital technologies are also highlighted by [4] as a key strategy to increase business resilience. Our results align with the findings of [73] to support a digital transformation process in SMEs needing to be introduced.

Future planning of the strategic sourcing of goods for the retail, food, medical, and agricultural supply chains will be particularly essential due to the current reliance on offshore producers and manufacturers. Although there was no shortage of products such as toilet paper and various food items, there was a delay in the ability to transport these goods to the store, and demand outstripped supply, causing a "bullwhip effect". Future planning could include increasing the safety stock of items not manufactured locally and increasing investment to boost the local manufacturing industry for essential goods. Reviews must be carried out to measure the cost of stockouts versus the cost of growing safety stock levels.

Investment in critical areas, such as local manufacturing, must be considered a high priority to mitigate risks and bolster a business's resilience against major supply chain disruptions post-COVID-19. Three-dimensional printing of extraordinarily complex equipment from various materials with the ability to be highly customized without the need for retooling between each printed product has the potential to ensure future-proof products against stockouts moving forward [72]. This approach would reduce or eliminate critical parts for medical or operational equipment being manufactured offshore. This method would also negate the extra costs of transport and storage. With further investment, 3D printing can become a cost-effective solution to managing the stockouts of customized equipment parts.

Implementing automation throughout the supply chain would reduce the risk of critical warehouse and transportation functions failing. Achieving this aspect would

include automated transportation, such as long-haul trucks, self-driving vehicles, and fully automated warehouses. Real-time data traffic management mapping could determine the most efficient delivery or transportation route, allowing maximum fuel efficiency and reducing potential delivery delays due to traffic congestion. Real-time data on the vehicle's performance and critical functions could also be monitored to predict any problems that may cause unplanned downtime [74]. There are currently significant costs associated with automation implementation; however, increased investment from multiple sectors would result in a considerable reduction in cost in a relatively short period. Moving forward, supply chain managers will need to weigh up initial capital expenditure against the potential value of lost revenue if a major supply chain disruption occurs again.

Strategic alliances between logistics service providers (LSPs) will become a favorable option when future planning for post-COVID-19. Horizontal cooperation between LSPs is critical to reducing transportation costs by consolidating loads and routes to benefit both parties equally [75]. The goal of horizontal cooperation is to achieve a win–win outcome for all participating LSPs. Ideally, horizontal cooperation partners are LSPs who operate on the same level of a supply chain. Successful horizontal cooperation will see results that exceed those of what would have been possible by the individual LSP. The benefits of implementing horizontal cooperation within an LSP's future business model can include financial benefits, access to a wider distribution network, and reduction in costs, as both LSPs will benefit from each other in the sense of asset utilization and broader supply chain network capabilities [76].

Lessons learned post-COVID-19 will be critical to business modeling and future-proofing global supply chains. The highest importance must be placed on the information gathered regarding what failed, why it failed, and long-term solutions to mitigate the risk of those issues occurring again. Strong financial investment into the continued development and introduction of technologies, such as 3D printing, automation, and blockchain technologies, is vital. Creating strong horizontal strategic partnerships between LSPs will also ensure larger distribution networks and increased asset utilization while reducing transport costs and thus streamlining supply chains.

6. Limitations

The quantitative survey data are helpful in determining the factors that are important for a business to improve business resilience. However, a deeper understanding of the business manager's and owner's experiences during the pandemic needs to be collected through interviews to interrogate the quantitative findings comprehensively and prepare steps that can be applied to support businesses to build and increase supply chain resilience.

7. Future Research

Future studies could apply a qualitative method to investigate business owners' experiences during the pandemic and delve into the efficiency of different supporting packages introduced by the government in building business capacities to enhance supply chain resilience.

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