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Managing the COVID-19 Pandemic: Enhancing Sustainable Supply Chain Performance through Management Innovation, Information Processing Capability, Business Model Innovation and Knowledge Management Capability in Pakistan

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Abstract: The advent of the novel coronavirus, also called COVID-19, caused widespread disruptions worldwide. This unprecedented health crisis led to major disruptions in supply chain networks; therefore, innovative strategies and capabilities have the potential to alleviate its impacts. Considering this situation, this study examined how COVID-19 impacted management innovation, the information processing capability, business model innovation, knowledge management capability, and sustainable supply chain performance (SSCP) in Pakistan. To test hypotheses, data were collected from companies in Pakistan engaged in supply chain management or supply chain departments within manufacturing companies, and investigations were carried out employing structural equation modeling. Based on empirical results, COVID-19 outbreaks negatively impacted SSCP, but not management innovation, information processing capability, business model innovation, or the knowledge management capability. Additionally, COVID-19 and SSCP are mediated by management innovation, the processing capability, business model innovation, and the knowledge management capability. By underlining the significance of the resource-based view, dynamic capability, and organizational information processing theories, this research contributes to the body of knowledge on sustainable supply chains. The conceptual model presented in this research may be used in supply chain (SC) and logistics management to reduce COVID-19 disruptions in SC operations and boost profitability during a pandemic.

Keywords: COVID-19; management innovation; information processing capability; business model innovation; knowledge management capability; sustainable supply chain performance

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1. Introduction

COVID-19 has put many business organizations into a financial bad patch; some of them have shut down entirely, making recovery very difficult [1]; this also has a major influence on enterprises' operations, sales, and production, having an adverse effect on firm performance [2]. According to [3], over ninety-four percent of the top one thousand companies have suffered consequences from the COVID-19 outbreak. Additionally, global exports of goods were USD 17.6 trillion in 2020, a 7.4% fall from the previous year. However, in the first half of 2021, export and import volumes increased by 13% [4]. Due to the COVID-19 outbreak, there has been a global reduction in the accessibility of SC [5]. Moreover, COVID-19 has a direct influence on supply and demand both globally and locally [6]. All SCs have seen adjustments due to the COVID-19 outbreak due to several lockdown procedures and movement limitations throughout Latin America [7]. Moreover, Qingbin, Liu [8] revealed that COVID-19 had reduced prices, increased difficulties in transferring food from one

supply chain segment to another, and caused higher production costs and labor shortages. Al-Hyari [9] observed that due to decreased demand, logistical issues, and transportation issues, the COVID-19 epidemic disrupted Jordan's SMS manufacturing industry, which saw a 67% fall in sales. Likewise, as shown by research conducted by Min, Zhang [10] after the COVID-19 epidemic in Wuhan, food SC was impacted by the lockout and transfer restriction measures; as a result, the enterprise lost 80% of its revenue. Additionally, the COVID-19 outbreak's lockdown and quarantine measures made it impossible to access markets, products, and supplies; more specifically, employees of the organization suffered mentally, financially, and socially. For this purpose, Ref. [11] emphasizes SC managers' challenges when attempting to operationalize the concepts of managing risks and flexibility in the SC and invites investigators to conduct an empirical study to evaluate how supply chain administrators handle COVID-19 concerns. Similarly, others draw attention to the need to research SC resilience and sustainability [12–16].

Most previous studies on SCs in the COVID-19 era focused on the issues and obstacles [17–19]. However, no study has been carried out to establish and confirm the mediation roles of management innovation, information processing competence, business model innovation, and knowledge management capability between the COVID-19 outbreak and the SSCP. Similarly, Refs. [20,21] calls for an empirical study on management innovation, information processing capability, business model innovation, and knowledge management competence to clarify how organizations confronting COVID-19 could create new strategies and capacities to reduce the epidemic's threats. Numerous studies have examined how COVID-19 is related to SSCP. For example, a study by [17] investigated the use of SC risk management to lessen the effect of interruptions on SC durability and adaptability in the situation of the COVID-19 pandemic. Similarly, Ref. [18] explored the connection between SSCP, COVID-19, and innovative approaches. Likewise, Ref. [19] studied the influence of SC amalgamation on corporate performance in Indonesia's manufacturing sector during the COVID-19 outbreak. Findings demonstrate that SC integration enhances creativity, SC adaptability, and toughness, resulting in enhanced business results. Therefore, new procedures must be created to increase a corporation's sustainability, or existing ones must be reorganized [14,20]. In this case, organizations must balance the triple bottom line (TBL), long-term viability, and stakeholder requirements while achieving favorable economic results [21,22].

Rasti Borazjani Faghat, Khani [22] states that innovation management in work environments offers benefits like increased productivity, people development, synergy, and long-term viability in supply chains. Yang, Xie [23] shows that aligning information processing capacity with resources lowers SC risks, enhancing sustainability. Tuominen [24] finds a strong positive correlation between channel collaboration and corporate value proposition in the grocery supply chain, with a contingency-specific profile. Another study [25] demonstrated that collaborative knowledge management practices, including activities like knowledge development, preservation, availability, distribution, and implementation, significantly improve supply chain collaboration and enhance knowledge efficiency in the manufacturing sectors.

Subsequently, the present research will answer the following questions:

Q1. Does the COVID-19 outbreak have an impact on SSCP?

Q2. Does the COVID-19 outbreak impact management innovation, information processing capability, business model innovation, and knowledge management capability?

Q3. Do management innovation, information processing capability, business model innovation, and knowledge management capability mediate between the COVID-19 outbreak and SSCP?

The study purpose is to fill the abovementioned gap by theoretically proposing and empirically testing a conceptual model arguing that management innovation, information processing capability, business model innovation, and knowledge management capability mediate between COVID-19 and SSCP. For this purpose, several research hypotheses are developed based on the resource-based view (RBV), dynamic capabilities (DCs), and orga-

nizational information processing theories (OIP). RBV is a theoretical framework that offers a strategic response to the challenges of the unstable business environment resulting from globalization, high-tech advancements, and economic downturns [26,27]. Furthermore, RBV considers organizations as a combination of distinct resources and competences that form the basis of the organization's strategy and are the main drivers of its productivity [28]. DCs are the ability to effectively utilize, enhance, and adjust outside and inside skills to respond effectively to the challenges of a continuously changing environment provides [29]. OIP theory offers a deeper knowledge of how organizations may effectively accomplish unforeseen interruptions in the supply chain [30]. Based on RBV, dynamic capabilities, and OIP theories, companies can implement SCRM practices to effectively address and manage disruptions [31]. Alraja, Imran [32] emphasizes that SMEs have the potential to attain sustainable supply chain performance amid the difficulties presented by the COVID-19 pandemic by leveraging innovation, adopting the RBV model, and [33] dynamic capabilities. Modgil, Gupta [34] revealed that utilizing OIP to identify, assess, rearrange, and initiate sequential stages plays a pivotal role in ensuring SC resilience during COVID-19, viewed from the perspective of the organizational information processing theory. Based on RBV, refs. [35,36] revealed that the knowledge management capability and business model innovation could play important roles in SC throughout the COVID-19 outbreak.

2. Literature Review

2.1. COVID-19 Outbreak and SSCP

Numerous scholars in the literature have substantiated the connection between the COVID-19 pandemic and the performance of sustainable supply chains [37]. Sharma, Adhikary [38] highlights that COVID-19 has had a particularly adverse effect on food supply systems, leading to an imbalance between demand and supply. Therefore, the situation has worsened due to an insufficient organizational structure and low resilience to the food SC. Ivanov [6] revealed that COVID-19 directly contributes to global and local changes in supply and demand. Likewise, de Paulo Farias and de Araújo [39] argues that the changes brought about by the novel coronavirus (COVID-19) in the food SC have led to shortages and rising expenses, leading to significant economic losses for companies operating in Brazil. Similarly, Min, Zhang [10] highlighted that during the COVID-19 epidemic in Wuhan, shutdown and movement limitation policies disrupted the food supply chain, losing 80% of the firms' income. Varshney, Roy [40] observed that COVID-19 mitigation regulations, such as shutdowns or shortages of workers, affected market operations and resulted in losses for food firms. The novel coronavirus (COVID-19) has adversely influenced the sustainability of SC performance. Furthermore, this pandemic has resulted in SC disruption, reduced economic activities, and changing consumer behavior, which all have a detrimental effect on the sustainability of SCs [41]. Consequently, drawing upon the literature reviewed, we proposed the following hypothesis:

H1: *The novel coronavirus (COVID-19) has an inverse impact on SSCP.*

2.2. COVID-19 Outbreak and Management Innovation

Global economic progress has been severely impacted by COVID-19. Consequently, businesses have embraced novel management principles to navigate these challenging circumstances and adapt to the "New Normal" [42]. Like, Serbulova, Morgunova [43] suggested that innovation may become an integral part of the company, which can help to overcome COVID-19 and enable the discovery, analysis and testing of new items and procedures. Li, Chen [20] highlights that the performance of SMEs has decreased due to the COVID-19 pandemic. As a result, this pandemic may indirectly increase organizational flexibility via organization management innovation to minimize the decline in SME performance. Azizi, Atlasi [44] revealed that the novel coronavirus (COVID-19) had numerous adverse impacts, such as alterations in social behavior, economic disruptions, and challenges for organizations in maintaining their regular operations. Hence, the author pro-

poses various management innovations and techniques to navigate the challenges posed by the COVID-19 outbreak. These include fostering adaptability, enhancing internal efficiency, acquiring talented individuals, and implementing creative changes based on organizational assessment and needs to ensure effective company operations. Carnevale [45] highlights that during the COVID-19 outbreak, the terms telework, online office, and digital workforce are employed in human resources management to support employees in adjusting to and coping with the alterations in their work setting. Therefore, to increase productivity, one must have the ability to integrate, adapt, and give instructions. Moreover, Abdullah, Huang [46] argued that service innovation would be necessary for human resource management during the COVID-19 outbreak. Thus, firms must reformulate new solutions to adapt to the present environment since they lack the management knowledge necessary to understand the quick COVID-19 breakout. So, based on the literature mentioned above, we proposed that:

H2a: *The COVID-19 outbreak positively affects the adoption of management innovation.*

2.3. COVID-19 Outbreak and Information Processing Capability

According to OIP theory, organizations must improve their capacity for information processing to be successful in a progressively ambiguous business environment [47]. Moreover, the theory emphasizes the necessity of implementing a system that effectively allocates scarce funds and increases the information processing capability of SC to effectively handle unanticipated occurrences by utilizing data patterns to predict real consumer demand [48]. In addition, the increased capacity of information processing can assist companies in monitoring SCs and help them manage risks and mitigate disruption to increase SC visibility [49]. SC resilience is needed in considering significant uncertainty related to the novel coronavirus (COVID-19), local and regional conflicts and natural disasters. Therefore, Lu, Jiang [50] revealed that the importance of SC information processing capability is strengthening SC resilience through supply chain governance. Similarly, Bag, Gupta [51] highlights that due to COVID-19, healthcare organizations need to enhance their information processing capabilities and develop greater SC responsiveness. Moreover, Wang, Yan [52] studied that concerning the COVID-19 outbreak, when information processing needs and capacity match, a firm has a higher degree of ambidexterity for exploration and exploitation, which enhances SC resilience in terms of agility, redundancy, and flexibility. Similarly, Yang, Xie [23] examined that a combination of information processing capacity and requirements will enhance SC risk management capabilities that, in turn, give rise to greater resilience within the SC. So, drawing from the literature discussed above, we are proposing that:

H2b: *The COVID-19 outbreak positively affects the adoption of the information processing capability.*

2.4. COVID-19 Outbreak and Business Model Innovation

In today's fast-changing, volatile environment, innovation in business models is vital to a firm's success, and it can provide opportunities when there are high fluctuations [53,54]. It is possible to benefit from new opportunities that increase company performance and could assist hospitality organizations in recovering if a business model is innovative via major improvements in the components' design or arrangement [55]. Moreover, Clauss, Breier [56] conclude that temporary business model innovation can be an effective strategy for SMEs to respond to exogenous crises such as the COVID-19 outbreak. Furthermore, business model innovation can increase strategic flexibility and create new revenue streams for firms. For instance, Bivona and Cruz [57] revealed that implementing business model innovation by small and medium-sized enterprises in the foodstuff and beverage sector could lead to a successful reaction to a disaster like the Novel coronavirus (COVID-19). Furthermore, it highlights three steps for SMEs to implement innovation in their business models, i.e., exploiting readily available resources, transforming existing sources into new

products or solutions, and taking advantage of the network's distant assets. Likewise, Breier, Kallmuenzer [58] explored that business model innovation has the potential to serve as a remedy for hospitality companies in their efforts to rebound from and manage the challenges posed by the COVID-19 outbreak. Additionally, it elaborated that adapting business models supported by loyal customers helped create new sources of revenue and ensured a better level of liquidity in times of crisis. Peñarroya-Farell and Miralles [59] described that SMEs face significant difficulties in enduring and overcoming the challenges presented by a humanitarian disaster such as the novel coronavirus. Hence, to endure the influence of the novel coronavirus crisis, businesses must modify their business models, and numerous companies have managed to overcome the pandemic's challenges by introducing modified business models. Therefore, based on the above literature, we proposed the following hypothesis:

H2c: *The COVID-19 outbreak positively affects the adoption of business model innovation.*

2.5. COVID-19 Outbreak and Knowledge Management Capability

According to [60–63], knowledge management significantly reduces overall uncertainty by promoting knowledge sharing, learning at the organizational level, exchanging information in networks, and including consumer input. Moreover, Yasmina, Rahmanto [64] explained that entrepreneurs in this sector need to understand the knowledge management strategies needed to restart small hospitality businesses affected negatively by COVID-19. Guo, Chen [65] found that companies' horizontal and vertical knowledge integration procedures have a favorable relationship with resilience. Therefore, vertical procedures build local company resilience more effectively, whereas horizontal knowledge integration processes increased global business resilience during COVID-19. Wang and Wu [66] outlined that healthcare organizations tackle crises like COVID-19 by employing efficient knowledge management practices and information technology tools. Implementing non-contact tracking technology, intelligent automation, telemedicine, and an AI-powered epidemic intelligence dashboard can reduce exposure risk and facilitate decision-making. Li, Hu [67] discussed that a company's ability to reply to problems like COVID-19 is significantly influenced by co-evolutionary knowledge management and business model renovation within e-commerce ecosystems. As a result, we recommend the following hypothesis based on the above literature:

H2d: *The COVID-19 outbreak positively affects the adoption of knowledge management capability.*

2.6. Management Innovation, Information Processing Capability, Business Model Innovation, Knowledge Management Capability, and SSCP

Management innovation plays a bigger role within the organization in terms of competition. So, to maintain a competitive edge in supply chain management, innovation is important. Hashim, Baig [68] demonstrated that implementing SCM practices significantly influences business performance. Furthermore, the importance of using a management innovation-categorized performance model is significant for enhancing SC efficiency, organizational flexibility, and cost-cutting [69]. Ozdemir, Sharma [70] highlight that management innovation is crucial for the resilience of the SC. Therefore, organizations may manage their supply networks efficiently amid crises via innovation and development. As a result, by cultivating positive relationships with employees and suppliers, organizations may strengthen their SCs. Siagian, Tarigan [71] elaborated that when different parts of a supply chain work well together, it can lead to better ways of making things (innovation), being able to adjust quickly to changes (flexibility), and being able to handle unexpected problems (resilience). In other words, supply chain integration boosts corporate success through innovation, adaptability, and robustness. Thus, businesses perform better, especially during difficult times like the COVID-19 outbreak.

Foerstl, Meinlschmidt [72] demonstrated that companies establish a suitable alignment between their information processing requirements and capabilities by electing appropriate

methods for information processing in long-term supply chain operations. Therefore, by implementing a specific combination of six information processing techniques, they can effectively manage sustainability-related uncertainties. Likewise, Ref. [73] argues that green internal and customer integration can create a distinctive information processing capability to increase environmental and financial efficiency. Also, collaboration and information sharing are utilized in green SC integration to increase information processing capacity and lower the likelihood of unpredictable results from the development of green products and processes. Yang, Xie [23] demonstrates that an excellent connection between information processing requirements and capabilities increases SC risk-handling abilities, increasing SC resilience during COVID-19. So, a firm must act quickly to process the information that is available from vendors upstream, final consumers, and marketplaces. The firm's information processing capabilities must meet these information processing needs, which are reflected in disruption orientation and SC visibility. Tang [74] highlights that from the perspective of information processing, a company can lessen its information processing requirements by implementing methods like safety stock, supplier diversity, flexible manufacturing, and product redesign.

Nosratabadi, Mosavi [75] examined that successful strategies in the food industry entail incorporating innovative elements into the value proposition, value generation processes, and value delivery methods of business models. The authors of [76] discovered that the company required a restructuring of its business model, which introduced new players and altered the positions of the existing ones in the business ecosystem. Sun, Gong [77] highlights that the SC should proactively manage the SC network structure and focus on developing dynamic capabilities. As a result, the entire SC business model is likely to continually adjust to external changes and achieve long-term growth. Similarly, Ref. [24] highlights that channel collaboration and corporate value proposition have a substantial positive correlation in grocery SC, and the connection has a contingency-specific profile. Berti, Mulligan [78] described a revolutionary business strategy that redefines the food SC and creates new markets and values. Therefore, they established an online market and digital food hub that streamlines interactions between consumers and local food suppliers. Burgos and Ivanov [79] demonstrated that enhancements in online sales platforms, the implementation of digital twins in supply chains, complete visibility throughout the supply chain, and a change in organizational culture were implemented in response to the COVID-19 outbreak, driven by increased consumer demand and government initiatives.

Peng Wong and Yew Wong [80] examine the connections between SCM and knowledge management capability. So, results indicate that knowledge management capabilities will interact with SCM strategies to affect business performance. The authors of [81] described a comprehensive framework demonstrating the connections between SCM, knowledge management, critical success factors, and knowledge development. Therefore, Knowledge management entices people to gather, arrange, and share knowledge throughout SC organizations. Hult, Ketchen [82] revealed that SCM procedures might improve inter-organizational connections by using knowledge to promote creativity and competitive advantage. Maqsood, Walker [83] emphasized integrating knowledge management into learning chains. He found that long-term interactions between enterprises, consumers, and traders through knowledge-sharing networks would become increasingly common in the SC environment. Furthermore, knowledge management among SC members would improve productivity and efficacy in SC procedures [84] and long-term viability, competitive advantages, and enhanced efficiency [85,86]. Li, Tarafdar [25] show that collaborative knowledge management practices (such as knowledge development, preservation, availability, distribution, and implementation) improve SC collaboration and supply chain knowledge efficacy in manufacturing sectors. Consequently, drawing from the literature reviewed, we formulated the following hypothesis:

H3a: *Management innovation is positively correlated with SSCP.*

H3b: *Information processing capability is positively correlated with SSCP.*

H3c: *Business model innovation is positively correlated with SSCP.*

H3d: *Knowledge management capability is positively correlated with SSCP.*

2.7. The Mediating Role of Management Innovation, Information Processing Capability, Business Model Innovation, and Knowledge Management Capability

According to [71], SC resilience is improved by innovation structures' and SC flexibility's capability to reply to unexpected shifts in customer demand and manufacturing issues. Therefore, SC integration boosts corporate success in the COVID-19 outbreak through management innovation, SC flexibility, and SC resilience. Moreover, ref. [87] revealed that resilient SCs have previously incorporated innovations, which helps businesses be more knowledgeable and prepared for unforeseen SC disruptions. In a post-pandemic environment, Filimonau [88] provides feasible solutions to help the hotel business manage its garbage. Therefore, a business corporation between hospitality enterprises and other food SC actors is necessary for such integration's success. Sharma, Luthra [89] explores the effect of the novel coronavirus on merchandizing SCs and outlines essential priorities and resilient approaches for retailers to embrace in the outcome of the novel coronavirus (COVID-19). Furthermore, collaboration efficiency, order fulfillment, and digital retail supply chains are crucial for enhancing business performance and achieving sustainability. The authors of [90] highlight that to improve the flexibility of the healthcare SC during the novel coronavirus by focusing on five resilient management practices that can increase buying flexibility: coordination, agility, accessibility, adaptability, and information exchange.

Dubey, Gunasekaran [91] research conducted within the framework of OIP theory has demonstrated the significance of robust information processing capability for firms in their ability to bounce back from supply chain disruptions. Similarly, interruption direction as an informal, natural control approach and SC availability as a formal mechanical control method have been coupled to satisfy the information processing needs caused by uncertainty and necessity during the worldwide COVID-19 epidemic's disruptive emergence. Therefore, capabilities for SC risk management can only be enhanced by matching information processing capabilities and demands [23]. The study presented in [92] revealed that the company's effective implementation of an Omni-channel strategy, which improves its SC flexibility, is attributed to its ability to continuously align its internal information processing capabilities with the evolving external demands caused by external circumstances. In addition, this capability has played a vital role in assisting the company to thrive even amidst the difficulties posed by the COVID-19 outbreak. Messina, Barros [93] highlights how the information management model assists SC and logistics for those in authority across the information lifecycle to give better insight and categorization during an interruption. Furthermore, the manufacturing supply chains have faced significant disruptions due to the COVID-19 outbreak, making it more difficult for makers of in-demand and vital commodities like toilet paper and hand sanitizer to stay in business; therefore, Paul and Chowdhury [94] emphasize that optimal SC performance during emergencies can be achieved if information processing demands and related capacities are being established. Similarly, information processing capabilities are essential for SCs to withstand and swiftly recover from catastrophic occurrences since natural disasters' unpredictable interruptions make them unable to survive [95].

The COVID-19 outbreak countermeasures have caused catastrophic harm to the global food SC. Münch and Hartmann [96] highlights that business model innovation may be a practical approach to overcoming the pandemic and enhancing organizational resilience. Seetharaman [97] discussed that due to the novel coronavirus (COVID-19) dilemma, companies would quickly invent digital substitutes, business models, and low-touched distribution techniques for their goods and services. So, these options have allowed businesses to creatively redesign their present products, build alternate digital goods and services, or rethink their distribution routes and approaches for transporting products and services.

Businesses may also use these chances to seek important positions and partners in the new ecosystem who can help them achieve their objectives. The authors of [98] investigated business models that aid in addressing disruptions brought on by the COVID-19 epidemic in SME companies. Burgos and Ivanov [79] demonstrated improvements in online sales channels, the practice of digital twins in SCs, end-to-end transparency, and a shift in organizational culture that had been made to the purchasing power and government steps in reply to the novel coronavirus (COVID-19). Ketchen Jr and Craighead [99] highlights that during the novel coronavirus (COVID-19) supply chain issues, restaurants changed their business models to focus on new potential sources of competitive advantage and new ways to connect customers (i.e., strategic management); providing doorstep delivery and pick-up services, creating take-home cookery sets, and selling pantry products that shoppers were having trouble locating at supermarkets were just a few of the ideas developed.

Li, Hu [67] states that the interdependent development of knowledge management capability (KMC) and (BM) business model renovation is crucial for a Chinese e-commerce company to effectively resolve the issues raised by the novel coronavirus (COVID-19). Additionally, sharing knowledge enhances cognitive capacity and the value of networks within companies. Integration of knowledge supports integrating multiple systems in business and facilitates collaborative decision-making, leading to the formation of new knowledge. Moreover, Orlando, Tortora [87] examined the effect of KC on the interruption of the global SC during the COVID-19 epidemic; the result indicated that knowledge is the key element in fostering resilience and protecting businesses from setbacks. Additionally, the effects of an SC interruption can only be somewhat mitigated through knowledge. Likewise, de Sousa Jabbour, Jabbour [100] suggested that to address and overcome disruptions, it is essential to develop and enhance skills related to knowledge management, identify faults, bottlenecks, possibilities for innovation, and practical solutions through both structured group discussions and improvisation with key players of the SC, which is essential to managing continuity. So, the ability to acquire knowledge and continuously develop, which is connected to the idea of SC culture, provides resilience in a cross-cutting way for all SC initiatives. Therefore, in order to develop understanding and valuable knowledge from the disturbance that occurred at each phase and finally provide useful learning for future events, knowledge management, creativity, administration, and disruptive environment awareness are necessary [101–103] and enhance the performance of sustainability management in SCs [104]. Consequently, drawing upon the literature mentioned earlier, we hypothesized that:

H4a: *The COVID-19 outbreak and SSCP relationship are influenced by the mediation of management innovation.*

H4b: *The COVID-19 outbreak and SSCP relationship are influenced by the mediation of information processing capability.*

H4c: *The COVID-19 outbreak and SSCP relationship are influenced by the mediation of business model innovation.*

H4d: *The COVID-19 outbreak and SSCP relationship are influenced by the mediation of knowledge management capability.*

3. Research Methodology

This study concentrated on Pakistani SC enterprises or SC sections of manufacturing corporations that were formally registered with Pakistan's Securities and Exchange Commission. For more information, refer to Table 1 for Demographic Information and Data Collection. We sent out questionnaires through web-based links in Facebook groups run by these companies for their company operation. Additionally, the survey was distributed to respondents via LinkedIn, WhatsApp, and emails. In the end, 270 total replies were sub-

mitted; 16 of those responses were not complete. Furthermore, a total of 254 questionnaires were deemed suitable for subsequent analysis.

Table 1. Demographic Analysis.

Participants	Description	Frequency	Percentage
Gender	Male	168	66%
	Female	86	34%
Total		254	100%
Age	20 to 29	56	22.04%
	30 to 39	80	31.49%
	40 to 49	68	26.77%
	Above 50	50	19.68%
Total		254	100%
Education	Undergraduate	44	17.32%
	Graduate	160	62.99%
	Postgraduate	50	19.68%
Total		254	100%
Hierarchy	Senior management	54	21.25%
	Supervisory staff	88	34.64%
	Low-level management	112	44.09%
Total		254	100%
Job experience	Less than five years	114	44.88%
	6 to 9	84	33.07%
	10 to 14	33	12.99%
	Above 15 years	23	9.05%
Total		254	100%

The respondents answered the questionnaire items using a five-point Likert scale. It ranged from 1 (strongly disagree) to 5 (strongly agree). To accomplish these aims and objectives, five items represent the constructs concerning the novel coronavirus, and the scale employed in this study has been adopted from previous research conducted by [105] Cronbach's alpha standardization value ($\alpha = 0.836$). We utilized a set of five items to measure the management innovation, sourced from [20] with a meaningful value of $\alpha = 0.878$. We assessed the information processing capability construct using five items from [101] with a standardized Cronbach's value ($\alpha = 0.778$). We used five items of the business model innovation adopted from [106] with an acceptable value of $\alpha = 0.788$. Knowledge management capability five measurement scales were adopted from [107]. Cronbach's alpha has an applicable value calculated to be 0.804, indicating good reliability. Additionally, nine items measuring the construct of SSCP were adopted from previous studies conducted by [108,109]; a Cronbach's alpha rating of 0.967 indicates a high level of internal coherence. An overview of the questionnaires is presented in Appendix A.

In this study, we used SmartPLS (version 4) to perform variance-based structural equation modeling (PLS-SEM) [110]. To answer our study's questions, we employed partial least squares (PLS), a well-suited predictive method for analyzing complex models. This study utilized PLS-SEM with six constructs, following the approach [111] suggested. Additionally, PLS-SEM provides more versatility by eliminating problems associated with inadmissibility and factor indeterminacy, as highlighted by [112]. The PLS-SEM method is also useful for developing theories while working with complex and exploratory models [113]. The data were additionally evaluated to ascertain its potential for experiencing common method bias. This study employed Harman's one-factor test, a methodology employed in prior research endeavors [114,115], to investigate the outcomes of the un-rotated factor solutions. Additionally, this analysis aimed to ascertain the number of factors responsible for explaining the variability observed in the variables [114]. Figure 1 indicates the proposed model.

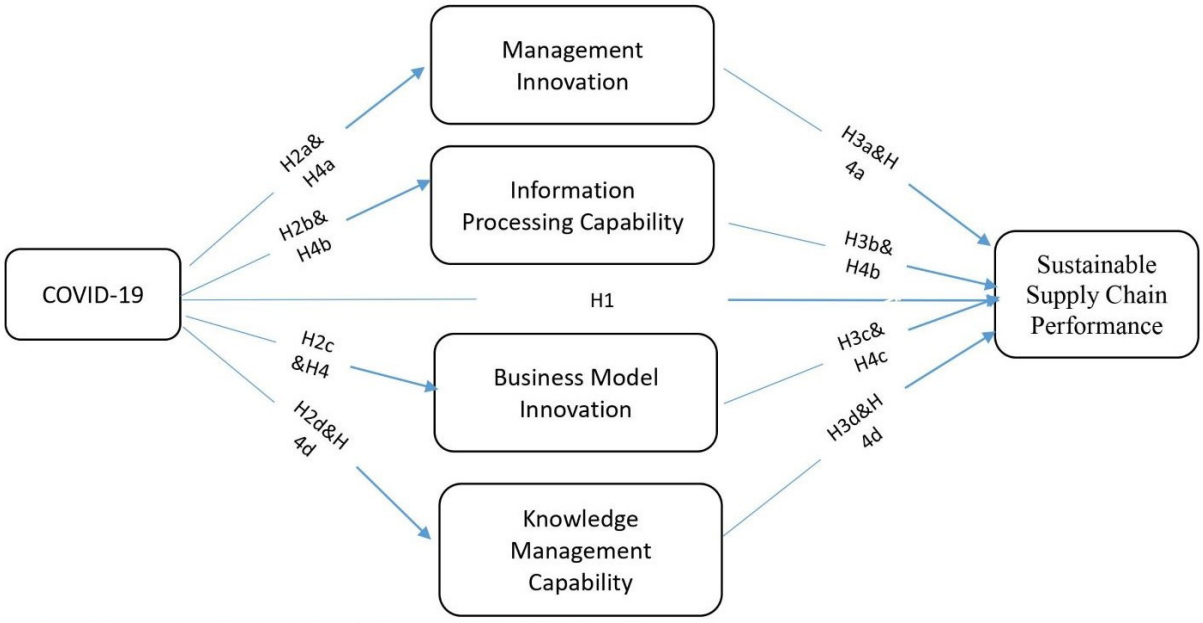

Figure 1. Hypothesized model of COVID-19 and sustainable supply chain performance.

4. Analysis of Data and Results

4.1. Common Method Bias

The common method bias (CMB) phenomenon is progressively emerging as a notable apprehension among quantitative scholars, as it undermines the methodological rigor of research endeavors. Jordan and Troth [116] stated that the phenomenon of CMB arises when data about all variables are acquired through a uniform methodology. Hence, the primary method employed for gathering data in this study was through the utilization of self-reporting questionnaires. This adoption potentially elevates the prospect of the emergence of CMB. Therefore, we performed Harman's single-factor analysis technique, and the outcomes demonstrate that CMB is not a significant concern since only one single factor was extracted to explain 29.7% of the variation in the dependent variable, which falls short of the 50% threshold [117].

4.2. Measurement Model

Measurement models are employed to confirm the dimension, accuracy, and consistency of latent constructs [118]. Each construct's measurement model's suitability was evaluated by looking at its item loadings and composite reliability, convergent validity (AVE), and discriminant validity (Table 2). The trustworthiness of items was successfully verified by fulfilling the requirements of having outer loadings, composite reliability over 0.70, and Cronbach's Alpha above the minimal criterion of 0.60 [119]. Moreover, the convergent validity of all construct values was higher than 0.50.

Table 2. Factor Loading.

	Factor Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
COVID1	0.764	0.836	0.885	0.606
COVID2	0.794			
COVID3	0.819			
COVID4	0.800			
COVID5	0.709			
SSCP1	0.890	0.967	0.972	0.813
SSCP2	0.905			

Table 2. *Cont.*

	Factor Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
SSCP3	0.903			
SSCP4	0.926			
SSCP5	0.887			
SSCP6	0.874			
SSCP7	0.905			
SSCP8	0.923			
Mi1	0.798	0.878	0.911	0.671
Mi2	0.799			
Mi3	0.816			
Mi4	0.856			
Mi5	0.825			
IPC1	0.798	0.778	0.857	0.601
IPC2	0.808			
IPC3	0.722			
IPC4	0.770			
BMI1	0.859	0.788	0.876	0.703
BMI2	0.793			
BMI3	0.862			
KMC1	0.799	0.804	0.871	0.629
KMC2	0.804			
KMC3	0.814			
KMC4	0.754			

We carried out two approaches to check the validity of discriminators. We checked [120] first, which requires that every construction's AVE square root is higher than any other construct's and more closely related to each other. According to Table 3, all constructs fulfilled this condition.

Table 3. Fornell and Larcker analysis.

	BMI	COVID-19	IPC	KMC	MI	SSCP
BMI	0.839					
COVID-19	0.456	0.778				
IPC	0.716	0.558	0.775			
KMC	0.266	0.443	0.351	0.793		
MI	0.403	0.153	0.388	0.083	0.819	
SSCP	0.036	−0.183	0.108	0.161	0.192	0.902

The second method used was the heterotrait–monotrait ratio (HTMT) method. The range of the constructions' HTMT values was between 0.069 and 0.688 (Table 4), for which none exceeded the minimum value of 0.90 [121]. In addition, we used the bootstrap method to assess whether HTMT is fundamentally distinct from 1 regarding inference. The model's confidence intervals for each combination of constructs indicate that the value 1 falls outside the range of confidence (HTMT < 1).

Table 4. Heterotrait–monotrait ratio (HTMT).

	BMI	COVID-19	IPC	KMC	MI	SSCP
BMI						
COVID-19	0.560					
IPC	0.505	0.688				
KMC	0.334	0.540	0.441			
MI	0.482	0.175	0.468	0.118		
SSCP	0.069	0.198	0.134	0.178	0.205	

The R^2 score indicates how well independent factors account for the variation in dependent variables. The value of R^2 for each dependent variable is depicted in Figure 2. SSCP has an R^2 value of 0.189, which indicates that five other variables: COVID-19, management innovation, information processing capability, business model innovation, and knowledge management capability, all concurrently account for 18.9% of SSCP. Falk and Miller [122] suggested that R^2 values should be equal to 0.10 or greater than 0.10 for the amount of variance accounted for by a certain endogenous construct to be assessed as sufficient.

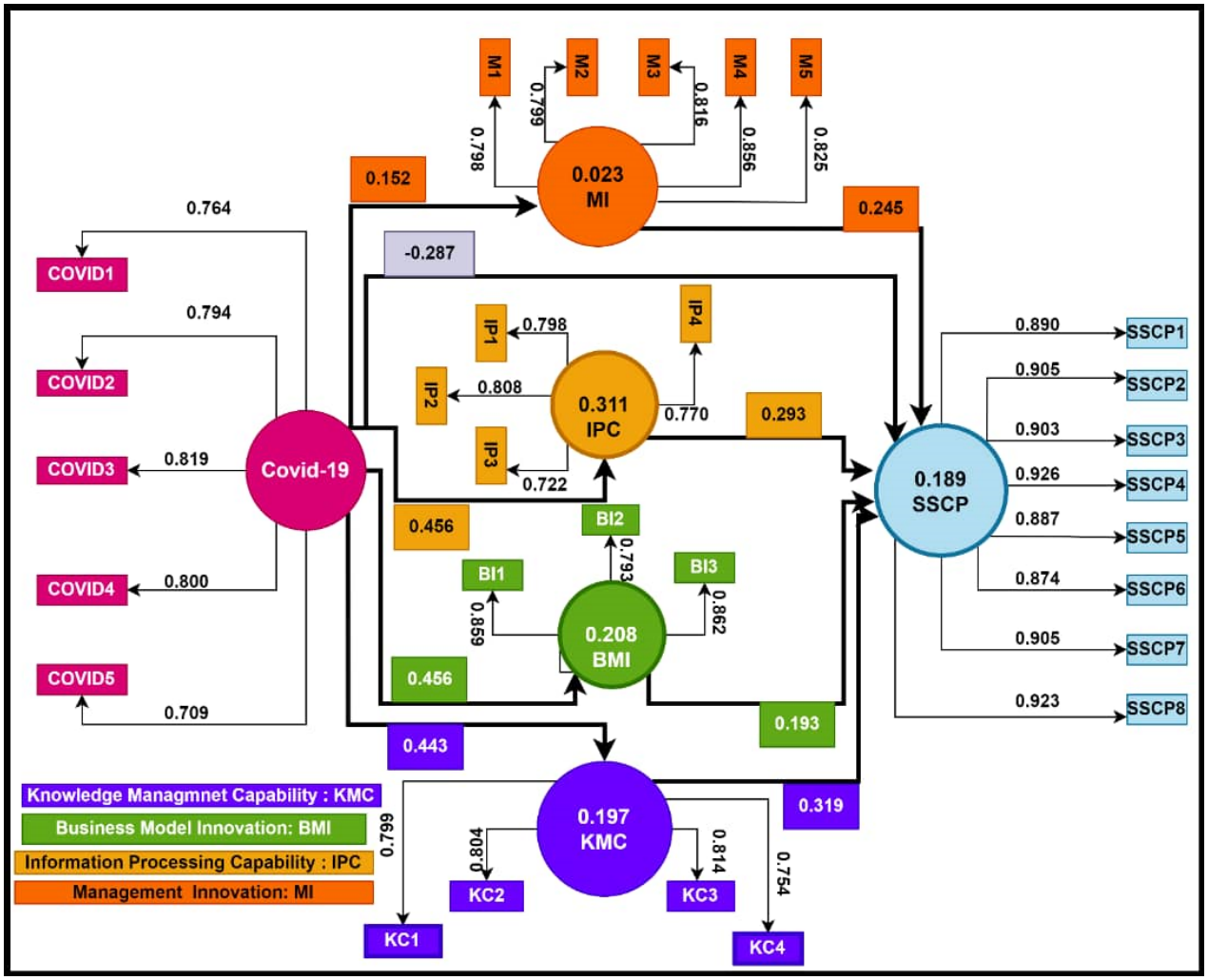

Figure 2. Structured modeling analysis.

The change in R^2 is assessed if a particular exogenous construct is removed from the framework to more accurately calculate the explanatory value of every independent variable in the framework. It is called the F^2 effect size. In other words, the effect size measures how much each independent variable affects the dependent variable. If an independent variable is eliminated from the PLS path framework, the change in squared correlation value is measured to determine if the removed independent variable has a strong influence on the value of the dependent variable. The structural influence of the predictor variable is strong if F^2 is 0.35, moderate if F^2 is 0.15, and low if F^2 is 0.02 [123]. The model F^2 effect size indicates how much an independent latent variable adds to the R^2 value of a dependent latent variable. The results (Table 5) showed that the F^2 effect size varied from 0.024 to 0.451.

Table 5. Quality of the structural model.

	Q^2	F^2
BMI	0.198	0.263
KMC	0.174	0.245
MI	0.112	0.024
IPC	0.293	0.451

A further essential evaluation is determining if the study model meets the criteria for predictive significance in relation to the established need. The results are based on PLS analysis, and the Q^2 results show the ability to predict potential. If the value of Q^2 is more than 0.0, a research model shall be considered suitable for predicting this dependent variable's value. For each of the research's dependent variables, the value of Q^2 is shown in Table 5, and all values are higher than 0. Consequently, the model appears to have some degree of predictive significance.

To confirm the study's model, SmartPLS 4 assesses the general effectiveness of the model. Therefore, the standardized root mean square residual (SRMR) index is used, and a value less than 0.08 is considered an adequate fit [124]. Meanwhile, SRMR = 0.07 shows important model quality. Furthermore, the normed fit index (NFI) was 0.961 (>0.90), demonstrating a good model fit [125].

4.3. Structural Model Analysis

Table 6 demonstrates the outcomes of the Smart PLS's structural model analysis. To elucidate the connections between variables, correlation analysis, and path coefficients were employed. The bootstrap resampling approach was employed to stabilize the assessments of coefficients, evaluate the errors, and ascertain the importance of these coefficients.

Table 6. PLS structural model.

	Beta (β)	(STDEV)	T Value	*p* Values
COVID-19 -> SSCP	−0.287	0.093	3.068	0.002
COVID-19 -> MI	0.153	0.078	1.967	0.049
COVID-19 -> IPC	0.558	0.078	7.170	0.000
COVID-19 -> BMI	0.456	0.078	5.696	0.000
COVID-19 - > KMC	0.443	0.078	5.655	0.000
MI -> SSCP	0.246	0.041	6.003	0.000
IPC -> SSCP	0.293	0.095	3.089	0.002
BMI -> SSCP	0.193	0.078	2.469	0.014
KMC -> SSCP	0.319	0.050	5.450	0.000
COVID-19 -> MI -> SSCP	0.144	0.023	3.010	0.003
COVID-19 -> IPC -> SSCP	0.163	0.058	2.830	0.005
COVID-19 -> BMI -> SSCP	0.088	0.041	2.124	0.034
COVID-19 -> KMC -> SSCP	0.141	0.045	3.121	0.002

The study model and the analysis results based on SmartPLS software are shown in Figure 2. The analysis results, which relate directly to H1 up to H3d and indirectly to hypothesis H4a until H4d, are also shown in Table 6. Moreover, the mediating path analysis has been upheld by performing a mediation script to analyze directly and indirectly related relationships according to the guidelines set out in the [126] study. As previously defined, thirteen (13) hypotheses were formulated, and thirteen (13) of them received statistical support with t-values greater than 1.96. The predetermined hypotheses were subjected to additional examination. The investigation was performed based on an important level of 5%, a critical t-value of 1.96, and a *p*-value of 0.05. The hypothesis is supported by statistical evidence if the *p*-value is less than 0.05 and the t-value exceeds 1.96 [127]. The results show an inverse connection between the novel coronavirus (COVID-19) and SSCP. The findings of this investigation provide more evidence that there is a positive relationship between the

COVID-19 outbreak and management innovation H2a (β = 0.153; $p \leq 0.05$); H2b information processing capability (β = 0.558; $p \leq 0.05$); H2c business model innovation (β = 0.456; $p \leq 0.05$); and knowledge management capability (β = 0.443; $p \leq 0.05$). Table 6 (H3a, H3b, H3c, H3d) argues that there is a significant connection between business model innovation, information processing capability, business model innovation, knowledge management capability, and SSCP. Additionally, the results of the investigation provide confirmation supporting the connection between management innovation and SSCP H3a (β = 0.245; $p \leq 0.05$); information processing capability H3b (β = 0.293; $p \leq 0.05$); business model innovation and SSCP H3c (β = 0.193; $p \leq 0.05$); and knowledge management capability and sustainable supply chain performance H3d (β = 0.319; $p \leq 0.05$). Furthermore, for indirect effects, we employ the methodology of [126]; therefore, the findings of this research validate that management innovation serves as a positive mediator in the connection between the novel coronavirus (COVID-19) and SSCP (β = 0.144; $p \leq 0.05$). Similarly, the findings also suggest that the information processing capability plays a constructive role as a mediator in the interaction between the novel coronavirus (COVID-19) and sustainable supply chain performance (β = 0.163; $p \leq 0.05$); the relationship between the novel coronavirus (COVID-19) and SSCP is positively influenced by the mediation of business model innovation (β = 0.088; $p \leq 0.05$). Additionally, the connection between the novel coronavirus (COVID-19) and sustainable supply chain performance is positively influenced by the mediation of the knowledge management capability (β = 0.141; $p \leq 0.05$).

5. Discussion

The COVID-19 outbreak has affected global supply chains. Innovative strategies and capabilities should be adopted to maintain SSCP. This research examines the connection between the novel coronavirus (COVID-19) and sustainable supply chain through management innovation, information processing capability, business model innovation, and knowledge management capability. An innovative theoretical structure is proposed with several hypotheses. The findings of this research are categorized into two types of hypotheses: (i) hypotheses related to direct relationships and (ii) hypotheses related to mediation effects. Three hypotheses have been presented with respect to the direct results (H1, H2a, H2b, H2c, H2d, and H3a, H3b, H3c, H3d). The study's findings regarding H1 indicate a direct negative effect of the novel coronavirus (COVID-19) on SSCP, aligning with the results of a previous study [37]. Likewise, the study's findings (H2a, H2b, H2c, and H2d) conclude a positive connection between the novel coronavirus (COVID-19) and the implementation of information processing capability, management innovation, business model innovation, and knowledge management capability in the Pakistani context. Regarding management innovation, our study findings align with a previous investigation [20]; regarding information processing capability, our study's findings are corroborated by past research [23]; regarding business model innovation, our study is supported by an earlier study [59]; and regarding knowledge management capability, our study result is consistent with a previous study [67]. Finally, H3a, H3b, H3c, and H3d represent that SSCP significantly positively influenced management innovation, information processing capability, business model innovation, and the knowledge management capability. Meanwhile, according to the experimental outcomes of this study, it was argued that the companies that deny management innovation, information processing capability, business model innovation, and knowledge management capability could not carry out their corporate operations during the novel coronavirus (COVID-19). Regarding the significance of management innovation, information processing capability, business model innovation, and knowledge capability, our findings align with a previous study. Regarding management innovation, Artsiomchyk and Zhivitskaya [128] revealed that management innovation plays a significant part in SSCP; to increase operational effectiveness and service quality, SC innovations blend new logistical and advertising strategies with advances in knowledge and associated technology. Regarding information processing capability, Yang, Xie [23] demonstrates that an appropriate connection between information processing demands and capabilities increases SC

risk control abilities, enhancing supply chain resilience under COVID-19. As a result, the company must move swiftly to process information from upstream vendors, downstream consumers, and markets. Concerning business model innovation, Tuominen [24] elaborated that channel collaboration and corporate value proposition have a substantial positive correlation in the grocery supply chain, and the connection has a contingency-specific profile. Regarding knowledge management capability, Hult, Ketchen [82] found that supply chain management practices might improve inter-organizational connections by implementing knowledge for creativity and competitive advantage.

The findings of this study condensed the mediation outcomes into hypotheses (H4a, H4b, H4c, and H4d). Structural equation modeling (SEM) examined and validated the mediation effects of management innovation, information processing capability, business model innovation, and knowledge management capability. The findings revealed that these variables affect the link between the novel coronavirus (COVID-19) and sustainable supply chain performance, aligning with previous literature. Regarding management innovation, supply chain resilience is increased by innovation systems' and supply chains' flexibility's capacity to respond to unforeseen shifts in consumer demand and production issues. Hence, supply chain integration boosts corporate success in COVID-19 through innovation, flexibility, and resilience [71]. Orlando, Tortora [87] highlights that among various supply chain innovations, inventory management innovation played a critical role in enabling firms to withstand supply chain disruptions. Regarding the information processing capability, he revealed that the company's effective implementation of an Omnichannel strategy, which improves its SC flexibility, is attributed to its ability to continuously align its internal information processing capabilities with the evolving external demands caused by external circumstances. In addition, this capability has played a significant role in enabling the company to thrive despite the challenges posed by the COVID-19 outbreak. Münch and Hartmann [96] highlights that business model innovation may be a practical approach to overcoming the pandemic and enhancing organizational resilience. Another study [97] mentioned that due to the problems faced by the novel coronavirus (COVID-19), companies would quickly invent digital substitutes or business models and low-touched distribution techniques for their goods and services. So, these options have allowed businesses to creatively redesign their present products, build alternate digital goods and services, or rethink their distribution routes and approaches for transporting products and services. Orlando, Tortora [87] examined the outcome of knowledge capability on the interruption of the global SC during the COVID-19 epidemic; the result indicated that knowledge is the key element in fostering resilience and protecting businesses from setbacks. Additionally, the outcome of an SC disruption can only be somewhat mitigated through knowledge.

5.1. Theoretical and Practical Implications

The purpose of this investigation is to add to the current literature on SSCP and address the request made by numerous scholars for further empirical research in this area [20,21]. This study also adds value by emphasizing the relevance of the RBV, dynamic capability view, and OIP theories concerning innovative strategies and capabilities. Therefore, by integrating the RBV, organizational processing theory, and dynamic capabilities, this investigation offers a comprehensive understanding of the interaction between these concepts and their assessment in the context of SSCP. According to [129], RBV is the most frequently utilized theory to represent the sustainability problem in supply chain development. Therefore, the resource-based view (RBV) contends that the capability, capacity, and competitive advantage of a firm is anchored on its internal resources (physical, human, and organizational), which must be valuable, scarce, and irreplaceable [28]. Dynamic capability is the ability to 'integrate, build, and reconfigure internal and external competences to address rapidly changing environments' [29]. The dynamic capability increases these activities, particularly in turbulent times when changes are ubiquitous, by rapidly aggregating, renewing, and transforming resources into new competencies to capitalize on

these changes [130]. The information processing theory states that a company's information processing needs should match its information processing capabilities [47]. Therefore, a company's capacity to process gains knowledge along with its capacity to deal with uncertainty [31,49]. By doing this, we contribute further insights into current research on the connection between the novel coronavirus (COVID-19) and SSCP [31,37].

The theoretical model proposed in this paper has the potential to be a useful tool for supply chain and logistics managers in effectively managing supply chain interruptions affected by the novel coronavirus (COVID-19). By implementing this model, managers can navigate the crisis, enhance profitability, and sustain operations during these challenging times. As a result, COVID-19 challenges society emotionally, emphasizing the need for successful supply chains. Therefore, we emphasize the importance of viable SC and suggest new strategies and capabilities for economic recovery. The results of our research indicate that creating partnerships between employers and workers could provide a wide range of possibilities for logistics, supply chains, and manufacturing companies to enhance their effectiveness and output. To encourage the implementation of intelligent systems and distributed ledgers in the logistics and SC sectors, the government could give financial incentives like tax credits and interest-free financing. Mere digitalization of systems is insufficient; governments and organizations should also organize training programs to equip their workforce with the necessary technological skills to seamlessly operate digital systems.

5.2. Limitations and Future Research Directions

This research has some limitations that may make the topic more appealing and encourage further publication. Firstly, the study was based on cross-sectional data. Therefore, for future investigations, it is recommended to utilize longitudinal data. Secondly, the study's data were gathered from Pakistan's SC and manufacturing business. Therefore, further studies should be undertaken across various countries and sectors to broaden the scope of research. Thirdly, the study only focused on managers' perspectives, neglecting other stakeholders' views. Ultimately, the research solely relied on quantitative methods, disregarding the potential for qualitative methods to offer a more comprehensive and nuanced comprehension of the subject matter.

6. Conclusions

This study concludes that management innovation, information processing capability, business model innovation, and the knowledge management capability are mitigating strategies and capabilities for SSCP during the novel coronavirus (COVID-19) in the Pakistani setting. The research findings validated the existence of a correlation between the novel coronavirus (COVID-19) and management innovation, the information processing capability, business model innovation, and the knowledge management capability. Similarly, management innovation, the information processing capability, business model innovation, and the knowledge management capability impact SSCP. The investigation also confirmed the mediation effect of management innovation, the information processing capability, business model innovation, and the knowledge management capability in the relationship between the pandemic and SSCP.

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Institutional Review Board Statement: This study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of Chang'an University, China.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data can be obtained via email by contacting Basit2811@gmail.com.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree	1	2	3	4	5
How did COVID-19 outbreak negatively affect Supply Chain?					
1. The COVID-19 virus is present in all parts of the country?					
2. The COVID-19 virus made a serious impact on the way we conduct business?					
3. Did COVID-19 negatively affect Overall operations?					
4. Did COVID-19 negatively affect Lead time for delivery?					
5. Did COVID-19 negatively affect Purchasing costs for supply?					
To what extent does Management Innovation mitigate the impact of COVID-19 on Supply chain performance?					
1. Rules and procedures within our organization are renewed during the COVID-19 pandemic.					
2. Our organization makes changes to our employee's tasks and functions during the COVID-19 pandemic.					
3. Our organization implements new management systems during the COVID-19 pandemic.					
4. The policy concerning salary has been changed during the COVID-19 pandemic.					
5. Our organization continuously alter certain elements of the organizational structure during the COVID-19 pandemic.					
To What extent do Information processing capabilities mitigate the impact of COVID-19 on Supply chain performance?					
1. During COVID-19 we freely communicate information about our successful and unsuccessful customer experiences across all business functions.					
2. During COVID-19 All of our business functions (e.g., marketing, manufacturing, R&D, finance, and supply chain management) are integrated with serving the needs of our target markets.					
3. Our supply chain partners routinely exchange timely market demand or supply information.					
4. During COVID-19 Our supply chain partners are committed to developing and sharing supply chain-related information.					
5. All functional departments work hard to thoroughly and jointly solve problems.					
To what extent does Business model innovation mitigate the impact of COVID-19 on Supply chain performance?					
1. Introduced new products or services as a new value proposition during COVID-19.					

2. Value delivery Started to collaborate with new business partners during COVID-19.
3. Shared new responsibilities with business partners during COVID-19.
4. Focused on a completely new market segment during COVID-19.
5. Introduced a new pricing mechanism during COVID-19
To what extent does knowledge management capability mitigate the impact of COVID-19 on Supply chain performance?
1. Employee's ability to collaborate, combine and exchange ideas among themselves to diagnose and solve problems and create opportunities.
2. Share their own ideas to formulate new product or service ideas.
3. Share their experiences to successfully implement new projects or initiatives.
4. Learn to share their ideas and knowledge and the commonality of sharing and exchanging ideas to find solutions to problems.
5. Our organization structure facilitates the creation of new knowledge
To what extent Supply chain performance effect during COVID-19.
1. Our organization can quickly deal with disruption
2. The supply chain would quickly recover to its original state.
3. Our Organization would not take long to recover normal operating performance.
4. Our Organization can easily restore material flow.
5. Improving supplier capabilities for enhancing social, economic, and environmental outcomes
6. Structural arrangement of supply chains for achieving sustainability outcomes.
7. System ability to meet the demands of survival in a dynamic environment.
8. Collaboration with suppliers for joint planning to achieve sustainability outcomes.

References

1. Rai, S.S.; Rai, S.; Singh, N.K. Organizational resilience and social-economic sustainability: COVID-19 perspective. *Environ. Dev. Sustain.* **2021**, *23*, 12006–12023. [CrossRef] [PubMed]
2. Salisu, A.A.; Akanni, L.O. Constructing a global fear index for the COVID-19 pandemic. *Emerg. Mark. Financ. Trade* **2020**, *56*, 2310–2331. [CrossRef]
3. Fortune. 94% of the Fortune 1000 Are Seeing Coronavirus Supply Chain Disruptions. 2020. Available online: https://fortune.com/2020/02/21/fortune-1000-coronavirus-china-supply-chain-impact/ (accessed on 15 March 2022).
4. WTO. Trade Set to Plunge as COVID-19 Pandemic Upends Global Economy. 2020. Available online: https://www.wto.org/english/news_e/pres20_e/pr855_e.htm (accessed on 25 April 2022).
5. Araz, O.M.; Choi, T.-M.; Olson, D.L.; Salman, F.S. Data analytics for operational risk management. *Decis. Sci.* **2020**, *51*, 1316–1319. [CrossRef]
6. Ivanov, D. Predicting the impacts of epidemic outbreaks on global supply chains: A simulation-based analysis on the coronavirus outbreak (COVID-19/SARS-CoV-2) case. *Transp. Res. Part E Logist. Transp. Rev.* **2020**, *136*, 101922. [CrossRef] [PubMed]

7. Meneses-Navarro, S.; Freyermuth-Enciso, M.G.; Pelcastre-Villafuerte, B.E.; Campos-Navarro, R.; Meléndez-Navarro, D.M.; Gómez-Flores-Ramos, L. The challenges facing indigenous communities in Latin America as they confront the COVID-19 pandemic. *Int. J. Equity Health* **2020**, *19*, 63. [CrossRef]
8. Qingbin, W.; Liu, C.-q.; Zhao, Y.-f.; Kitsos, A.; Cannella, M.; Wang, S.-k.; Lei, H. Impacts of the COVID-19 pandemic on the dairy industry: Lessons from China and the United States and policy implications. *J. Integr. Agric.* **2020**, *19*, 2903–2915.
9. Al-Hyari, K. Initial Empirical Evidence on How Jordanian Manufacturing SMES Cope with the COVID-19 Pandemic. *Acad. Strateg. Manag. J.* **2020**, *19*, 1–12.
10. Min, S.; Zhang, X.; Li, G. A snapshot of food supply chain in Wuhan under the COVID-19 pandemic. *China Agric. Econ. Rev.* **2020**, *12*, 689–704. [CrossRef]
11. Hoek, R. Research opportunities for a more resilient post-COVID-19 supply chain—Closing the gap between research findings and industry practice. *Int. J. Oper. Prod. Manag.* **2020**, *ahead-of-print*. [CrossRef]
12. Cavalcante, I.M.; Frazzon, E.M.; Forcellini, F.A.; Ivanov, D. A supervised machine learning approach to data-driven simulation of resilient supplier selection in digital manufacturing. *Int. J. Inf. Manag.* **2019**, *49*, 86–97. [CrossRef]
13. Ivanov, D.; Dolgui, A. OR-methods for coping with the ripple effect in supply chains during COVID-19 pandemic: Managerial insights and research implications. *Int. J. Product. Econ.* **2021**, *232*, 107921. [CrossRef] [PubMed]
14. Chaouni Benabdellah, A.; Zekhnini, K.; Cherrafi, A. Sustainable and resilience improvement through the design for circular digital supply chain. In *Proceedings Part IV, Advances in Production Management Systems. Artificial Intelligence for Sustainable and Resilient Production Systems, Proceedings of the IFIP WG 5.7 International Conference, APMS 2021, Nantes, France, 5–9 September 2021*; Springer: Cham, Switzerland, 2021; pp. 550–559.
15. Khanuja, A.; Jain, R.K. The conceptual framework on integrated flexibility: An evolution to data-driven supply chain management. *TQM J.* **2023**, *35*, 131–152. [CrossRef]
16. Mastroberardino, P.; Calabrese, G.; Cortese, F.; Petracca, M. New perspectives of experiential tourism: An exploratory analysis of live virtual tours during the COVID-19 outbreak. *TQM J.* **2021**, *34*, 1732–1751. [CrossRef]
17. Karmaker, C.L.; Ahmed, T.; Ahmed, S.; Ali, S.M.; Moktadir, M.A.; Kabir, G. Improving supply chain sustainability in the context of COVID-19 pandemic in an emerging economy: Exploring drivers using an integrated model. *Sustain. Prod. Consum.* **2021**, *26*, 411–427. [CrossRef]
18. Kumar, A.; Luthra, S.; Mangla, S.K.; Kazançoğlu, Y. COVID-19 impact on sustainable production and operations management. *Sustain. Oper. Comput.* **2020**, *1*, 1–7. [CrossRef]
19. Yu, Z.; Rehman Khan, S.A. Evolutionary game analysis of green agricultural product supply chain financing system: COVID-19 pandemic. *Int. J. Logist. Res. Appl.* **2022**, *25*, 1115–1135. [CrossRef]
20. Li, Y.; Chen, H.; Wei, L.; Wei, L. COVID-19 Pandemic and SMEs Performance Decline: The Mediating Role of Management Innovation and Organizational Resilience. *Front. Public Health* **2022**, *10*, 944742. [CrossRef] [PubMed]
21. Khan, S.A.R.; Ponce, P.; Tanveer, M.; Aguirre-Padilla, N.; Mahmood, H.; Shah, S.A.A. Technological innovation and circular economy practices: Business strategies to mitigate the effects of COVID-19. *Sustainability* **2021**, *13*, 8479. [CrossRef]
22. Rasti Borazjani Faghat, E.; Khani, N.; Alemtabriz, A. A paradigmatic model for shared value innovation management in the supply chain. *Int. J. Innov. Sci.* **2020**, *12*, 142–166. [CrossRef]
23. Yang, J.; Xie, H.; Yu, G.; Liu, M. Antecedents and consequences of supply chain risk management capabilities: An investigation in the post-coronavirus crisis. *Int. J. Prod. Res.* **2021**, *59*, 1573–1585. [CrossRef]
24. Tuominen, M. Channel collaboration and firm value proposition. *Int. J. Retail. Distrib. Manag.* **2004**, *32*, 178–189. [CrossRef]
25. Li, Y.; Tarafdar, M.; Subba Rao, S. Collaborative knowledge management practices: Theoretical development and empirical analysis. *Int. J. Oper. Prod. Manag.* **2012**, *32*, 398–422. [CrossRef]
26. Wernerfelt, B. A resource-based view of the firm. *Strateg. Manag. J.* **1984**, *5*, 171–180. [CrossRef]
27. Barney, J.B. Purchasing, supply chain management and sustained competitive advantage: The relevance of resource-based theory. *J. Supply Chain. Manag.* **2012**, *48*, 3–6. [CrossRef]
28. Barney, J. Firm resources and sustained competitive advantage. *J. Manag.* **1991**, *17*, 99–120. [CrossRef]
29. Teece, D.J.; Pisano, G.; Shuen, A. Dynamic capabilities and strategic management. *Strateg. Manag. J.* **1997**, *18*, 509–533. [CrossRef]
30. DuHadway, S.; Carnovale, S.; Hazen, B. Understanding risk management for intentional supply chain disruptions: Risk detection, risk mitigation, and risk recovery. *Ann. Oper. Res.* **2019**, *283*, 179–198. [CrossRef]
31. El Baz, J.; Ruel, S. Can supply chain risk management practices mitigate the disruption impacts on supply chains' resilience and robustness? Evidence from an empirical survey in a COVID-19 outbreak era. *Int. J. Product. Econ.* **2021**, *233*, 107972. [CrossRef]
32. Alraja, M.N.; Imran, R.; Khashab, B.M.; Shah, M. Technological Innovation, Sustainable Green Practices and SMEs Sustainable Performance in Times of Crisis (COVID-19 pandemic). *Inf. Syst. Front.* **2022**, *24*, 1081–1105. [CrossRef] [PubMed]
33. Ozanne, L.; Chowdhury, M.; Prayag, G.; Mollenkopf, D. SMEs navigating COVID-19: The influence of social capital and dynamic capabilities on organizational resilience. *Ind. Mark. Manag.* **2022**, *104*, 116–135. [CrossRef]
34. Modgil, S.; Gupta, S.; Stekelorum, R.; Laguir, I. AI technologies and their impact on supply chain resilience during COVID-19. *Int. J. Phys. Distrib. Logist. Manag.* **2022**, *52*, 130–149. [CrossRef]
35. Christa, U.; Kristinae, V. The effect of product innovation on business performance during COVID-19 pandemic. *Uncertain Supply Chain. Manag.* **2021**, *9*, 151–158.

36. Ngo, V.M.; Nguyen, H.H.; Pham, H.C.; Nguyen, H.M.; Truong, P.V.D. Digital supply chain transformation: Effect of firm's knowledge creation capabilities under COVID-19 supply chain disruption risk. *Oper. Manag. Res.* **2022**, *16*, 1003–1018.
37. Khan, S.A.R.; Waqas, M.; Honggang, X.; Ahmad, N.; Yu, Z. Adoption of innovative strategies to mitigate supply chain disruption: COVID-19 pandemic. *Oper. Manag.* **2022**, *15*, 1115–1133.
38. Sharma, A.; Adhikary, A.; Borah, S.B. COVID-19's impact on supply chain decisions: Strategic insights from NASDAQ 100 firms using Twitter data. *J. Bus. Res.* **2020**, *117*, 443–449. [CrossRef] [PubMed]
39. De Paulo Farias, D.; de Araújo, F.F. Will COVID-19 affect food supply in distribution centers of Brazilian regions affected by the pandemic? *Trends Food Sci. Technol.* **2020**, *103*, 361–366.
40. Varshney, D.; Roy, D.; Meenakshi, J. Impact of COVID-19 on agricultural markets: Assessing the roles of commodity characteristics, disease caseload and market reforms. *Indian Econ. Rev.* **2020**, *55*, 83–103. [CrossRef]
41. Hobbs, J.E. Food supply chains during the COVID-19 pandemic. *Can. J. Agric. Econ./Rev. Can. D'agroecon.* **2020**, *68*, 171–176.
42. Carracedo, P.; Puertas, R.; Marti, L. Research lines on the impact of the COVID-19 pandemic on business. A text mining analysis. *J. Bus. Res.* **2021**, *132*, 586–593.
43. Serbulova, N.; Morgunova, T.; Persiyanova, G. Innovations during COVID-19 pandemic: Trends, technologies, prospects. In *E3S Web of Conferences*; EDP Sciences: Le Ulis, France, 2020.
44. Azizi, M.R.; Atlasi, R.; Ziapour, A.; Abbas, J.; Naemi, R. Innovative human resource management strategies during the COVID-19 pandemic: A systematic narrative review approach. *Heliyon* **2021**, *7*, e07233.
45. Carnevale, J.B.; Hatak, I. Employee Adjustment and well-being in the era of COVID-19: Implications for human resource management. *J. Bus. Res.* **2020**, *37*, 183–187. [CrossRef]
46. Abdullah, M.I.; Huang, D.; Sarfraz, M.; Sadiq, M.W. Service innovation in human resource management during COVID-19: A study to enhance employee loyalty using intrinsic rewards. *Front. Psychol.* **2021**, *12*, 627659. [PubMed]
47. Galbraith, J. *Designing Complex Organizations*; Addison-Wesley Pub. Co.: Boston, MA, USA, 1973.
48. Lusiantoro, L.; Yates, N.; Mena, C.; Varga, L. A refined framework of information sharing in perishable product supply chains. *Int. J. Phys. Distrib. Logist. Manag.* **2018**, *48*, 254–283.
49. Munir, M.; Jajja, M.S.S.; Chatha, K.A.; Farooq, S. Supply chain risk management and operational performance: The enabling role of supply chain integration. *Int. J. Product. Econ.* **2020**, *227*, 107667.
50. Lu, Q.; Jiang, Y.; Wang, Y. Improving supply chain resilience from the perspective of information processing theory. *J. Enterp. Inf. Manag.* **2023**, *ahead-of-print*. [CrossRef]
51. Bag, S.; Gupta, S.; Choi, T.-M.; Kumar, A. Roles of innovation leadership on using big data analytics to establish resilient healthcare supply chains to combat the COVID-19 pandemic: A multimethodological study. *IEEE Trans. Eng. Manag.* **2021**, 1–14. [CrossRef]
52. Wang, Y.; Yan, F.; Jia, F.; Chen, L. Building supply chain resilience through ambidexterity: An information processing perspective. *Int. J. Logist. Res. Appl.* **2023**, *26*, 172–189.
53. Pohle, G.; Chapman, M. IBM's global CEO report 2006: Business model innovation matters. *Strategy Leadersh.* **2006**, *34*, 34–40.
54. Giesen, E.; Riddleberger, E.; Christner, R.; Bell, R. When and how to innovate your business model. *Strategy Leadersh.* **2010**, *38*, 17–26.
55. Foss, N.J.; Saebi, T. Fifteen years of research on business model innovation: How far have we come, and where should we go? *J. Manag.* **2017**, *43*, 200–227.
56. Clauss, T.; Breier, M.; Kraus, S.; Durst, S.; Mahto, R.V. Temporary business model innovation–SMEs' innovation response to the COVID-19 crisis. *R&D Manag.* **2022**, *52*, 294–312.
57. Bivona, E.; Cruz, M. Can business model innovation help SMEs in the food and beverage industry to respond to crises? Findings from a Swiss brewery during COVID-19. *Br. Food J.* **2021**, *123*, 3638–3660.
58. Breier, M.; Kallmuenzer, A.; Clauss, T.; Gast, J.; Kraus, S.; Tiberius, V. The role of business model innovation in the hospitality industry during the COVID-19 crisis. *Int. J. Hosp. Manag.* **2021**, *92*, 102723. [PubMed]
59. Peñarroya-Farell, M.; Miralles, F. Business Model Adaptation to the COVID-19 Crisis: Strategic Response of the Spanish Cultural and Creative Firms. *J. Open Innov. Technol. Mark. Complex.* **2022**, *8*, 39.
60. Argote, L. *Organizational Learning: Creating, Retaining and Transferring Knowledge*; Springer Science & Business Media: New York, NY, USA, 2012.
61. Ceruti, M.; Williams, A.; Bedford, D. *Translating Knowledge Management Visions into Strategies*; Emerald Group Publishing: Bingley, UK, 2019.
62. Stacey, R. *Complex Responsive Processes in Organizations: Learning and Knowledge Creation*; Routledge: Oxfordshire, UK, 2003.
63. Vătămănescu, E.-M.; Cegarra-Navarro, J.-G.; Andrei, A.G.; Dincă, V.-M.; Alexandru, V.-A. SMEs strategic networks and innovative performance: A relational design and methodology for knowledge sharing. *J. Knowl. Manag.* **2020**, *24*, 1369–1392.
64. Yasmina, A.W.; Rahmanto, A.N.; Naini, A.M.I. Green hotel resilience due to COVID-19 pandemic: Case study at Greenhost boutique hotel Yogyakarta. In Proceedings of the International Conference on Sustainable Innovation Track Humanities Education and Social Sciences (ICSIHESS 2021), Virtual Conference, 25–26 August 2021; Atlantis Press: Amsterdam, The Netherlands, 2021.
65. Guo, Y.; Chen, Y.; Usai, A.; Wu, L.; Qin, W. Knowledge integration for resilience among multinational SMEs amid the COVID-19: From the view of global digital platforms. *J. Knowl. Manag.* **2023**, *27*, 84–104.
66. Wang, W.-T.; Wu, S.-Y. Knowledge management based on information technology in response to COVID-19 crisis. *Knowl. Manag. Res. Pract.* **2021**, *19*, 468–474.

67. Li, H.; Hu, Q.; Zhao, G.; Li, B. The co-evolution of knowledge management and business model transformation in the post-COVID-19 era: Insights based on Chinese e-commerce companies. *J. Knowl. Manag.* **2022**, *26*, 1113–1123.
68. Hashim, M.; Baig, S.A.; Amjad, F.; Nazam, M.; Akram, M.U. Impact of supply chain management practices on organizational performance and moderating role of innovation culture: A case of Pakistan textile industry. In Proceedings of the Thirteenth International Conference on Management Science and Engineering Management, St. Catharines, ON, Canada, 5–8 August 2019; Springer: Cham, Switzerland, 2020; Volume 1002.
69. Wang, H.-c.; Zhao, S.-q.; Yao, P.-j.; Zhu, Y.-f.; Sun, L. The Management Innovation Classified Performance Study on Supply Chain Vendor Manufacturing Enterprise. In Proceedings of the 2018 International Conference on Computer, Communications and Mechatronics Engineering (CCME 2018), Shanghai, China, 22–23 December 2018.
70. Ozdemir, D.; Sharma, M.; Dhir, A.; Daim, T. Supply chain resilience during the COVID-19 pandemic. *Technol. Soc.* **2022**, *68*, 101847.
71. Siagian, H.; Tarigan, Z.J.H.; Jie, F. Supply chain integration enables resilience, flexibility, and innovation to improve business performance in COVID-19 era. *Sustainability* **2021**, *13*, 4669.
72. Foerstl, K.; Meinlschmidt, J.; Busse, C. It's a match! Choosing information processing mechanisms to address sustainability-related uncertainty in sustainable supply management. *J. Purch. Supply Manag.* **2018**, *24*, 204–217.
73. Wong, C.Y.; Wong, C.W.Y.; Boon-itt, S. Effects of green supply chain integration and green innovation on environmental and cost performance. *Int. J. Prod. Res.* **2020**, *58*, 4589–4609.
74. Tang, C.S. Perspectives in supply chain risk management. *Int. J. Prod. Econ.* **2006**, *103*, 451–488. [CrossRef]
75. Nosratabadi, S.; Mosavi, A.; Lakner, Z. Food Supply Chain and Business Model Innovation. *Foods* **2020**, *9*, 132. [CrossRef]
76. Wang, Y.; Jia, F.; Schoenherr, T.; Gong, Y. Supply chain-based business model innovation: The case of a cross-border E-commerce company. *Sustainability* **2018**, *10*, 4362. [CrossRef]
77. Sun, Y.; Gong, Y.; Zhang, Y.; Jia, F.; Shi, Y. User-driven supply chain business model innovation: The role of dynamic capabilities. *Corp. Soc. Responsib. Environ. Manag.* **2021**, *28*, 1157–1170. [CrossRef]
78. Berti, G.; Mulligan, C.; Yap, H. DiGital food hubs as disruptive business models based on Coopetition and "shared value" for sustainability in the agri-food sector. In *Global Opportunities for Entrepreneurial Growth: Coopetition and Knowledge Dynamics within and across Firms*; Emerald Publishing Limited: Bingley, UK, 2017; pp. 415–438.
79. Burgos, D.; Ivanov, D. Food retail supply chain resilience and the COVID-19 pandemic: A digital twin-based impact analysis and improvement directions. *Transp. Res. Part E Logist. Transp. Rev.* **2021**, *152*, 102412. [CrossRef] [PubMed]
80. Peng Wong, W.; Yew Wong, K. Supply chain management, knowledge management capability, and their linkages towards firm performance. *Bus. Process Manag. J.* **2011**, *17*, 940–964. [CrossRef]
81. Kant, R.; Singh, M. An integrative framework of knowledge management enabled supply chain management. In Proceedings of the 2008 IEEE International Conference on Industrial Engineering and Engineering Management, Singapore, 8–11 December 2008; IEEE: Piscataway, NJ, USA, 2008.
82. Hult, G.T.M.; Ketchen, D.J.; Arrfelt, M. Strategic supply chain management: Improving performance through a culture of competitiveness and knowledge development. *Strateg. Manag. J.* **2007**, *28*, 1035–1052. [CrossRef]
83. Maqsood, T.; Walker, D.; Finegan, A. Extending the "knowledge advantage": Creating learning chains. *Learn. Organ.* **2007**, *14*, 123–141. [CrossRef]
84. Schoenherr, T.; Griffith, D.A.; Chandra, A. Knowledge management in supply chains: The role of explicit and tacit knowledge. *J. Bus. Logist.* **2014**, *35*, 121–135. [CrossRef]
85. Sambasivan, M.; Loke, S.P.; Abidin-Mohamed, Z. Impact of knowledge management in supply chain management: A study in Malaysian manufacturing companies. *Knowl. Process Manag.* **2009**, *16*, 111–123. [CrossRef]
86. Attia, A.; Essam Eldin, I. Organizational learning, knowledge management capability and supply chain management practices in the Saudi food industry. *J. Knowl. Manag.* **2018**, *22*, 1217–1242. [CrossRef]
87. Orlando, B.; Tortora, D.; Pezzi, A.; Bitbol-Saba, N. The disruption of the international supply chain: Firm resilience and knowledge preparedness to tackle the COVID-19 outbreak. *J. Int. Manag.* **2022**, *28*, 100876. [CrossRef]
88. Filimonau, V. The prospects of waste management in the hospitality sector post COVID-19. *Resour. Conserv. Recycl.* **2021**, *168*, 105272. [CrossRef] [PubMed]
89. Sharma, M.; Luthra, S.; Joshi, S.; Kumar, A. Accelerating retail supply chain performance against pandemic disruption: Adopting resilient strategies to mitigate the long-term effects. *J. Enterp. Inf. Manag.* **2021**, *34*, 1844–1873. [CrossRef]
90. Araujo, R.; Fernandes, J.M.; Reis, L.P.; Beaulieu, M. Purchasing challenges in times of COVID-19: Resilience practices to mitigate disruptions in the health-care supply chain. *J. Glob. Oper. Strateg. Source* **2022**, *ahead-of-print*. [CrossRef]
91. Dubey, R.; Gunasekaran, A.; Childe, S.J.; Fosso Wamba, S.; Roubaud, D.; Foropon, C. Empirical investigation of data analytics capability and organizational flexibility as complements to supply chain resilience. *Int. J. Prod. Res.* **2021**, *59*, 110–128. [CrossRef]
92. Zhang, L.; Wu, L.; Huang, L.; Zhang, Y. Wield the Power of Omni-channel Retailing Strategy: A Capability and Supply Chain Resilience Perspective. *J. Strateg. Mark.* **2021**, 1–25. [CrossRef]
93. Messina, D.; Barros, A.C.; Soares, A.L.; Matopoulos, A. An information management approach for supply chain disruption recovery. *Int. J. Logist. Manag.* **2020**, *31*, 489–519. [CrossRef]
94. Paul, S.K.; Chowdhury, P. A production recovery plan in manufacturing supply chains for a high-demand item during COVID-19. *Int. J. Phys. Distrib. Logist. Manag.* **2021**, *51*, 104–125. [CrossRef]

95. Zhu, S.; Song, J.; Hazen, B.T.; Lee, K.; Cegielski, C. How supply chain analytics enables operational supply chain transparency: An organizational information processing theory perspective. *Int. J. Phys. Distrib. Logist. Manag.* **2018**, *48*, 47–68. [CrossRef]
96. Münch, C.; Hartmann, E. Responding to the COVID-19 pandemic—Catching up in the food industry through business model innovation. *Int. J. Logist. Manag.* **2023**, *ahead-of-print*. [CrossRef]
97. Seetharaman, P. Business models shifts: Impact of COVID-19. *Int. J. Inf. Manag.* **2020**, *54*, 102173. [CrossRef]
98. Gregurec, I.; Tomičić Furjan, M.; Tomičić-Pupek, K. The impact of COVID-19 on sustainable business models in SMEs. *Sustainability* **2021**, *13*, 1098. [CrossRef]
99. Ketchen, D.J., Jr.; Craighead, C.W. Research at the intersection of entrepreneurship, supply chain management, and strategic management: Opportunities highlighted by COVID-19. *J. Manag.* **2020**, *46*, 1330–1341. [CrossRef]
100. De Sousa Jabbour, A.B.L.; Jabbour, C.J.C.; Hingley, M.; Vilalta-Perdomo, E.L.; Ramsden, G.; Twigg, D. Sustainability of supply chains in the wake of the coronavirus (COVID-19/SARS-CoV-2) pandemic: Lessons and trends. *Mod. Supply Chain. Res. Appl.* **2020**, *2*, 117–122. [CrossRef]
101. Kochan, C.G.; Nowicki, D.R. Supply chain resilience: A systematic literature review and typological framework. *Int. J. Phys. Distrib. Logist. Manag.* **2018**, *48*, 842–865. [CrossRef]
102. Ali, A.; Mahfouz, A.; Arisha, A. Analysing supply chain resilience: Integrating the constructs in a concept mapping framework via a systematic literature review. *Supply Chain. Manag. Int. J.* **2017**, *22*, 16–39. [CrossRef]
103. Scholten, K.; Sharkey Scott, P.; Fynes, B. Mitigation processes–antecedents for building supply chain resilience. *Supply Chain. Manag. Int. J.* **2014**, *19*, 211–228. [CrossRef]
104. Hosseini-Motlagh, S.-M.; Samani, M.R.G.; Saadi, F.A. A novel hybrid approach for synchronized development of sustainability and resiliency in the wheat network. *Comput. Electron. Agric.* **2020**, *168*, 105095. [CrossRef]
105. Adejare, B.O.; Olaore, G.O.; Udofia, E.E.; Adenigba, O.A. COVID-19 Pandemic and Business Survival as Mediation on the Performance of Firms in the FMCG-Sector. *Athens J. Bus. Econ.* **2021**, *7*, 239.
106. Latifi, M.-A.; Nikou, S.; Bouwman, H. Business model innovation and firm performance: Exploring causal mechanisms in SMEs. *Technovation* **2021**, *107*, 102274. [CrossRef]
107. Attia, A.; Salama, I. Knowledge management capability and supply chain management practices in the Saudi food industry. *Bus. Process Manag. J.* **2018**, *24*, 459–477. [CrossRef]
108. Altay, N.; Gunasekaran, A.; Dubey, R.; Childe, S.J. Agility and resilience as antecedents of supply chain performance under moderating effects of organizational culture within the humanitarian setting: A dynamic capability view. *Prod. Plan. Control* **2018**, *29*, 1158–1174. [CrossRef]
109. Sharma, M.; Luthra, S.; Joshi, S.; Kumar, A. Developing a framework for enhancing survivability of sustainable supply chains during and post-COVID-19 pandemic. *Int. J. Logist. Res. Appl.* **2022**, *25*, 433–453. [CrossRef]
110. Ringle, C.M.; Wende, S.; Becker, J. *Boenningstedt: SmartPLS GmbH*; Hamburg University of Technology (TUHH): Hamburg, Germany, 2015.
111. Sarstedt, M.; Hair, J.F., Jr.; Nitzl, C.; Ringle, C.M.; Howard, M.C. Beyond a tandem analysis of SEM and PROCESS: Use of PLS-SEM for mediation analyses! *Int. J. Mark. Res.* **2020**, *62*, 288–299. [CrossRef]
112. Fornell, C.; Bookstein, F.L. Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *J. Mark. Res.* **1982**, *19*, 440–452. [CrossRef]
113. Nitzl, C. The use of partial least squares structural equation modelling (PLS-SEM) in management accounting research: Directions for future theory development. *J. Account. Lit.* **2016**, *37*, 19–35. [CrossRef]
114. Koh, J.; Kim, Y.-G. Knowledge sharing in virtual communities: An e-business perspective. *Expert Syst. Appl.* **2004**, *26*, 155–166. [CrossRef]
115. Leimeister, J.M.; Sidiras, P.; Krcmar, H. Exploring success factors of virtual communities: The perspectives of members and operators. *J. Organ. Comput. Electron. Commer.* **2006**, *16*, 279–300. [CrossRef]
116. Jordan, P.J.; Troth, A.C. Common method bias in applied settings: The dilemma of researching in organizations. *Aust. J. Manag.* **2020**, *45*, 3–14. [CrossRef]
117. Hair, J.F., Jr.; Hult, G.T.M.; Ringle, C.M.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*; Sage Publications: Thousand Oaks, CA, USA, 2021.
118. Mardani, A.; Kannan, D.; Hooker, R.E.; Ozkul, S.; Alrasheedi, M.; Tirkolaee, E.B. Evaluation of green and sustainable supply chain management using structural equation modelling: A systematic review of the state of the art literature and recommendations for future research. *J. Clean. Prod.* **2020**, *249*, 119383. [CrossRef]
119. Hair, J.F.; Black, W.C.; Babin, B.J.; Anderson, R.E. *Multivariate Data Analysis*; Cengage: Boston, MA, USA, 2019.
120. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [CrossRef]
121. Henseler, J.; Ringle, C.M.; Sarstedt, M. Testing measurement invariance of composites using partial least squares. *Int. Mark. Rev.* **2016**, *33*, 405–431. [CrossRef]
122. Falk, R.F.; Miller, N.B. *A Primer for Soft Modeling*; University of Akron Press: Akron, OH, USA, 1992.
123. Cohen, J. *Statistical Power Analysis for the Behavioral Sciences*; Routledge: Abingdon, UK, 1988.
124. Hu, L.-t.; Bentler, P.M. Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychol. Methods* **1998**, *3*, 424. [CrossRef]

125. Hair, J.F.; Risher, J.J.; Sarstedt, M.; Ringle, C.M. When to use and how to report the results of PLS-SEM. *Eur. Bus. Rev.* **2019**, *31*, 2–24. [CrossRef]
126. Baron, R.M.; Kenny, D.A. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J. Pers. Soc. Psychol.* **1986**, *51*, 1173. [CrossRef] [PubMed]
127. Hair, J.F., Jr.; Sarstedt, M.; Hopkins, L.; Kuppelwieser, V.G. Partial least squares structural equation modeling (PLS-SEM). *Eur. Bus. Rev.* **2014**, *26*, 106–121. [CrossRef]
128. Artsiomchyk, Y.; Zhivitskaya, H. Designing Sustainable Supply Chain under Innovation Influence. *IFAC-Pap.* **2015**, *48*, 1695–1699. [CrossRef]
129. Touboulic, A.; Walker, H. Theories in sustainable supply chain management: A structured literature review. *Int. J. Phys. Distrib. Logist. Manag.* **2015**, *45*, 16–42. [CrossRef]
130. Blome, C.; Schoenherr, T.; Rexhausen, D. Antecedents and enablers of supply chain agility and its effect on performance: A dynamic capabilities perspective. *Int. J. Prod. Res.* **2013**, *51*, 1295–1318. [CrossRef]