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Review

COVID-19 and Supply Chain Disruption Management: A Behavioural Economics Perspective and Future Research Direction

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Abstract: The COVID-19 pandemic has been one of the most severe disruptions to normal life, impacting how businesses operate. The academic literature in the areas of supply chain and operations management has been trying to explain how this has affected decision-making in businesses. However, the existing literature has predominantly overlooked organisational culture and behavioural economic theories. This paper contends that considering the decisions made in supply chain disruption management involve groups and the individuals within them, the relevance of behavioural economic concepts becomes paramount. As such, the objective of this paper is to conduct an integrative literature review, utilising the purposive sampling method to explore the dearth of academic work connecting behavioural economic theories and organisational culture to supply chain disruption management. Additionally, the paper aims to offer guidelines for future research in this domain. Enhancing our comprehension of these domains concerning supply chain disruption management would empower firms to better anticipate their parties' decisions, refine their decision-making models, and cultivate stronger relationships with suppliers and customers.

Keywords: supply chain; disruption management; decision making; behavioural economics; organisational culture

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1. Introduction

The COVID-19 pandemic has been one of the most severe disruptions to normal life, how businesses operate, and society as a whole, in recent decades, with millions of cases and deaths being left in its wake [1–10]. Consequently, the academic literature in the areas of supply chain and operations management has been trying to explain (1) how the pandemic has affected different components of society (i.e., businesses, individuals, governmental bodies); (2) how these elements of society have responded to the pandemic; and (3) the theoretical and managerial implications that such responses entail through a myriad of theoretical perspectives. While there is a considerable body of research addressing various aspects of supply chain management in the context of COVID-19 [11,12], a distinct gap exists in exploring fundamental concepts related to the rationale behind organisations' decisions, the timing of these decisions, and how they can be enhanced. Notably, the literature on COVID-19 has largely overlooked the crucial roles of organisational culture and behavioural economic theories, both of which are foundational in understanding decision-making processes at both organisational and individual levels [13,14]. For instance, the pandemic has exposed vulnerabilities in global supply chains, and companies with a strong organisational culture emphasising adaptability and resilience have fared better in managing disruptions [15]. Behavioural economic theories offer insights into how decision-makers respond to risks and uncertainties, providing a basis for devising more effective strategies in supply chain disruption management during such crises [16]. These theoretical frameworks provide valuable insights that, when applied, can significantly contribute

to improving decision-making strategies during unprecedented disruptions, such as the COVID-19 pandemic.

Ultimately, this paper argues that because supply chain disruption management decisions are made by groups and the individuals that compose them (and they are unable to make rational decisions, even when not experiencing a disruption), the role of behavioural economic concepts is highly pertinent for explaining the rationale behind such decisions; this remains true for decisions made by groups of individuals, and the effects of organisational culture and group dynamics on said choices. These explanations, considered alongside the outcomes of said decisions, could provide practical examples to practitioners and, in turn, allow them to be more cognisant of their decisions and their impacts, be they positive or negative.

In this way, improving our understanding of these fields in relation to managing supply chain disruptions would not only allow for further transdisciplinary and multidisciplinary understanding but would also enable firms to predict their agents' decisions more accurately, improve their decision-making models (by planning/acting strategically), and develop their supplier and customer relationships, enabling them to make better decisions under disruptive conditions (i.e., speedier recoveries, improved supply chain performance and supplier relationships) [17]. Given this central premise and the novelty of linking these concepts to supply chain disruption management, the central questions of this research are "What linkages between behavioural economics, organisational culture, and supply chain disruption management have currently been explored?" and "What avenues for future research exist in this area?" Thus, the purpose of this paper is to explore the current state of knowledge in the area using an integrative literature review [18], with the works selected via the purposive sampling method. The review aims to acknowledge the existing gap in the academic literature concerning the connection between behavioural economic theories and organisational culture to various elements of supply chain disruption management. By systematically examining relevant literature, this paper seeks to identify where these linkages exist and underscore their importance in the context of supply chain resilience. The integrative literature review approach allows for a comprehensive understanding of the current landscape while also serving as a foundation for generating future research directions for academicians in the field. Ultimately, this work contributes to this field of research through this summation of the literature and the generation of avenues for future empirical research.

The rest of this paper is structured as follows: The methodology is briefly discussed before moving on to the literature review. The literature review is organised to discuss the current state of knowledge on a topic, before moving onto the topic's connection to behavioural economics and organisational culture and the literature gaps revealed in those areas. This is followed by a discussion of the implications of the findings, and the generation of future research opportunities. Finally, conclusions and limitations of the research are provided before ending with a summary of the proposed research directions. Please see Table 1 for the paper structure.

Table 1. Structure of the paper.

Section	Description
Introduction	Brief overview of the research topic and its significance.
Methodology	Brief discussion of the chosen research methodology.
Literature Review	Overview of the literature review section. Section 1: Current State of Knowledge Section 2: Connection to Behavioural Economics and Organisational Culture Section 3: Literature Gaps
Discussion	Analysis and discussion of the implications of the findings.

Table 1. *Cont.*

Section	Description
Future Research Opportunities	Exploration of potential areas for future research.
Conclusions	Summary of key findings.
Limitations	Discussion of the limitations inherent in the research.
Summary of Proposed Research Directions	Brief recapitulation of suggested areas for future research.

2. Methodology

It is acknowledged by the authors that additional primary research is needed to fully classify the nature of the responses to the COVID-19 pandemic as a supply chain disruption. In particular, data on the levels of commonality and differences observed in these rationales, the decisions made, and the outcomes achieved are needed. However, in order to identify such primary research opportunities, it is first required to comprehend and develop the relationships between behavioural economics/organisational culture and supply chain disruption management approaches. In this study, we conducted an integrative literature review [18], with the works selected via the purposive sampling method. Integrative literature reviews, through critical analysis, critique, and synthesis of the literature, can lead to the development of new insights for future research directions.

Initially, a preliminary literature review was conducted, which provided a solid foundation for determining inclusion criteria [19] and determined the key search terms to be used for searching the existing COVID-19 and supply chain literature. Due to the nature and the key focus of this study, which is based on an analysis of behavioural economics, we decided to use a combination of supply chain disruption, risk management strategy, behavioural economics, and organisational culture when searching for abstracts and identifying the relevance, scope, and focus of the articles [20] thorough search strategy was devised by searching databases like Emerald Insight, Scopus, ScienceDirect, and the Web of Science Core Collection in order to find all pertinent papers. Additionally, Google Scholar was utilised to locate grey literature on these subjects; due to the lack of discussion on these topics overall, the authors wanted to avoid the bias that can arise from sticking to journals. The keywords provided by the respective authors of the articles were utilised as the primary inclusion/exclusion criteria; if the keywords were representative of at least one of the three theoretical areas being explored (organisational culture, behavioural economics, and supply chain disruption management), the article was included in the pool of research. The quality of the works being cited was gauged (via their ABS journal ranking, SNIP score, timeliness, and number of public citations); however, due to the fundamental lack of work in certain areas of the literature, articles of lower quality have also been included in this work, meaning that no exclusionary criteria were engaged with.

A conceptual foundation was created for the examination of the research question after the preliminary literature review. Identifying potential themes in the framework facilitated the organisation and categorisation of data and guided the process of the literature review. This, through the integrative literature review, led to the identification of the emerging areas of research and the exploration of the interrelationships between behavioural economics, organisational culture, and supply chain disruptions. The research process is illustrated in Figure 1.

Linking the contributions of each study to the established concepts and themes throughout the coding process contributed to the confirmability of this study. The research background and literature review sections also explicitly explained the research environment and characteristics of the study's components to ensure transferability [21]. The general process of extracting and analysing the data was not well documented. However, it can generally be described as a notetaking and summation approach. However, this lack of documentation led to difficulties describing it in further depth; in total 529 articles were reviewed in this manner.

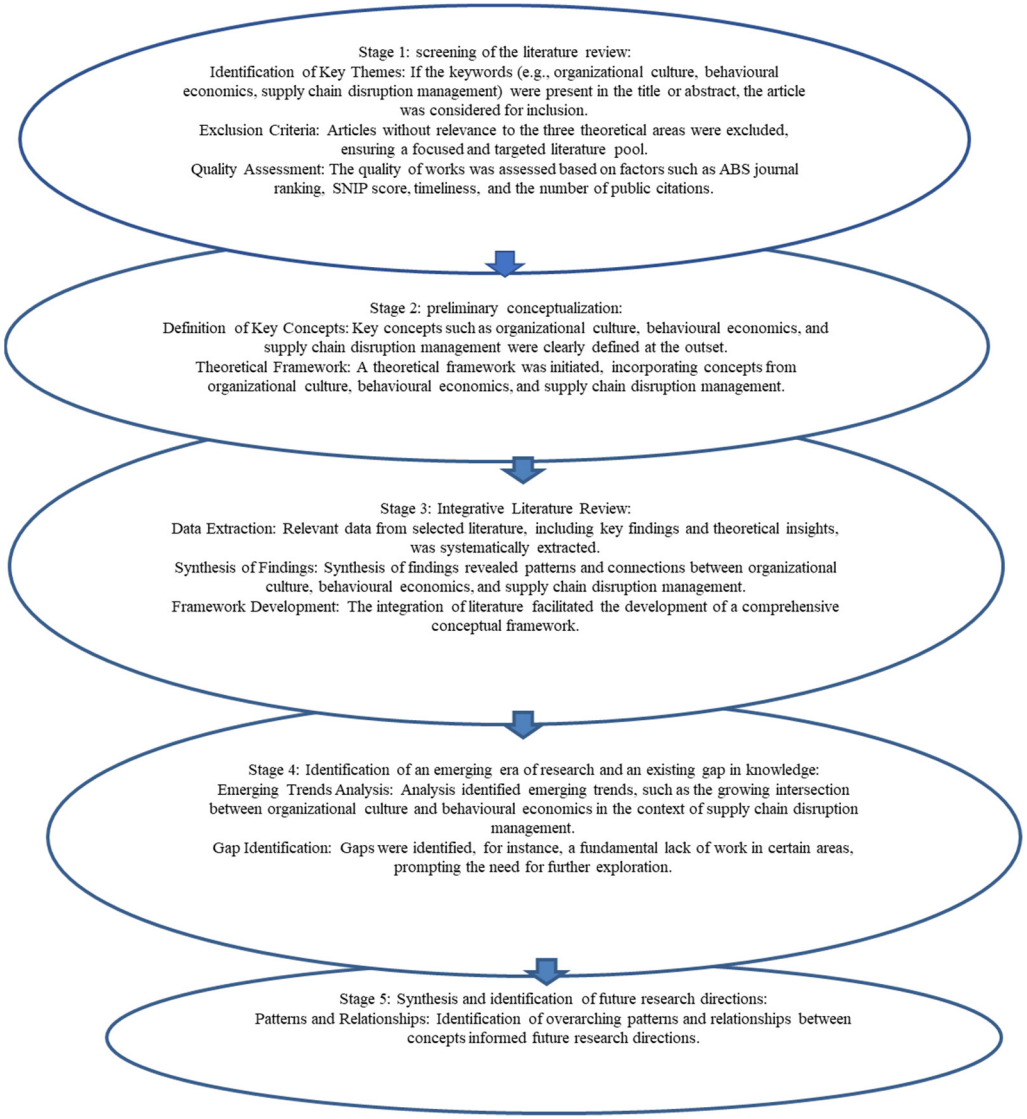

Figure 1. Research Process.

3. Existing Literature and Inter-Disciplinary Linkages

In order to generate future research directions, it is useful to note how the topics discussed are related to each other, and how each area contributes to the over-arching thesis statement, that the decisions underlying supply chain disruption management strategies can be explained through the theoretical lenses of behavioural economics and organisational culture; thus, more research is needed to empirically establish these connections and the practical impact of them. In this way, it is important to outline the tenuous linkages that presently exist, where gaps in knowledge lie, and the importance of exploring these gaps. This will enable the creation of a robust plan for future research endeavours that possess both theoretical and practical value, both on large and specific scales.

We first have the effects of COVID-19 on businesses, which mandated attention through supply chain disruption management techniques; within this theoretical area, a number of responses to the pandemic, as well as other disruptions, have been identified: crisis/risk management, supply chain agility/resilience, information sharing/collaboration, Industry 4.0/technological innovations, and leadership. The linkages between each of these areas and behavioural economics and organisational culture are then explored, leading to the definition of interdisciplinary relationships between the three core theories. This is visually represented in Figure 2.

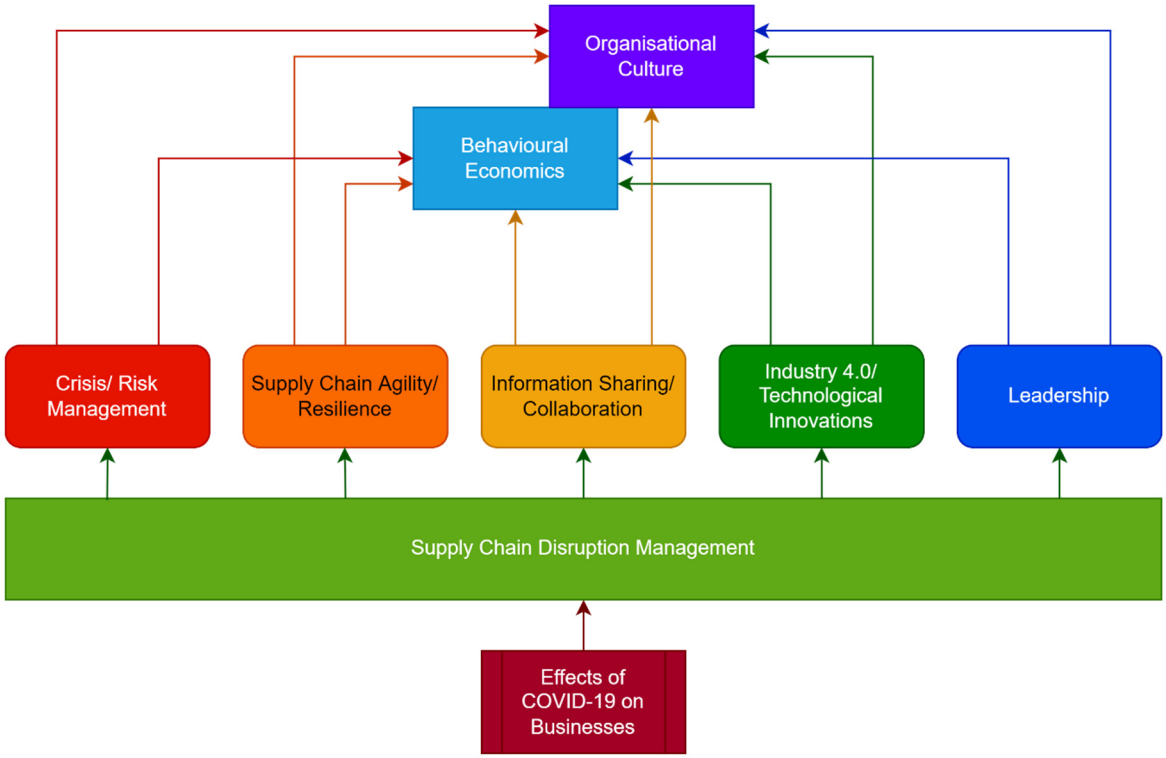

Figure 2. Interdisciplinary/Topical Linkages Discussed.

3.1. Effects of COVID-19 on Businesses

Despite various governmental measures introduced to control the spread of the pandemic, the most impactful have been the lockdowns and shelter-in-place orders. These restrictions have significantly altered business operations, particularly across international borders, by limiting the movement of people and goods. The literature extensively explores the numerous challenges arising from these disruptions, with different sectors experiencing distinct impacts. Sectors such as hospitality, tourism, and automotive face decreased demand, while grocery, humanitarian, and medical supply chains grapple with inflated yet uncertain demand, coupled with challenges related to uncertain supply, logistical disruptions, and labor shortages [7–9,22–40].

Consequently, numerous studies have delved into the pandemic's impact on supply and demand conditions across various industries, with a particular focus on the UK grocery industry. Additionally, extensive research has explored the broader effects of COVID-19 on various facets of business management [41–63].

Inter-Disciplinary Linkages/Research Gaps

Within the literature covering the effects of the pandemic on businesses, there is minimal attention on the effects of the lockdowns, uncertain supply/demand conditions, and logistical difficulties on the decision-making capabilities of individuals and groups within a business context. Much of the literature focused on risk aversion, loss aversion, and prospect theory on consumer behaviours throughout the pandemic, with the purpose of formulating implications for policymakers, academicians, and marketing practitioners [64–75]. One piece by Sarkar and Kumar (2015) explored inventory management decisions under disruptions. However, this was an experimental design conducted with university students outside the context of COVID-19; this serves as a notable exception [76].

On the other hand, regarding organisational culture, some of the literature has focused on how cultures evolved throughout a disruption [77–79]. For instance, Nyamunda et al. (2022) found that, while the changes (to culture, in response to the pandemic) were transformational in nature and that they were likely to be permanent, they were also

made out of necessity; ultimately, they recommend that the long-term impact of these changes must be understood, that cross-functional teams need to be created to support top-down decisions, that changes needed to be made to support working from home, and that effective cultures needed to be developed to support the changes induced by COVID-19 [79]. Otherwise, much of the literature's focus has been on changes in cultures in the face of planned changes [80–82]. Separately, numerous works discuss changes to culture that arose from shifting to remote working practices; however, the focus of these works is on how the changes affected employees at the individual level (i.e., creativity, preference to work from home, trust in the organisation) as opposed to its impact on organisational culture as a whole [83–86].

Aside from changes to organisational culture, national culture absorbed much of the attention in relation to COVID-19 and other disruptions, both within and outside the context of business decision-making [87–100].

3.2. Supply Chain Disruption Management

In tandem with works discussing the effects of the pandemic on businesses, the literature has also paid renewed attention to theories surrounding supply chain disruption management, with many works being published in the area in recent decades. However, in the context of COVID, most of this has been in the practical application of the concepts rather than its underlying theories, such as examples of actions that particular organisations have taken and how those actions factor into supply chain management. For instance, PPE acquisition strategies, shifting manufacturing strategies to accommodate the production of respirators, implementing work-from-home measures and the impact of this on operational activities, as well as the innovation of business models and logistical infrastructures, so that new customers may be reached, or existing customers can be reached in new ways (to match changing consumer behaviours). These are a few generic examples, but the literature has also explored a number of other responses to the pandemic on both micro and macro scales [27,30,35,44,97,101–145].

Within this discipline, it is common to categorise responses to a disruption in terms of "before" and "after" the disruption, with the former being referred to as mitigation strategies and the latter as recovery strategies [98,146–154]. However, this framework is most applicable to short-term disruptions resulting from one entity along the supply chain, and its application to disruptions that create large amounts of uncertainty, originate from multiple sources, and last for long durations is rather problematic, as "before" and "after" are difficult to define; this is evidenced by some authors indicating that after-shocks and disruption tails are more than likely to be pervasive during the recovery phase of the pandemic [155,156].

Inter-Disciplinary Linkages/Research Gaps

The literature has largely engaged with supply chain disruption management theories through the lens of neo-classical economics when, in reality, humans, particularly under times of severe disruption (i.e., stress), are not able to make rational decisions, making the behavioural model of decision-making (that acknowledges heuristics, prospect theory, risk aversion, and loss aversion) far more appropriate, for the same reasons that it has been applied in other contexts [73,157–163] (For foundational works see: [164–168]). Similarly, group decisions and the role of organisational culture in such decisions have been largely unexplored in the context of supply chain disruptions, particularly in the context of COVID-19. In addition to the effects of behavioural economics and organisational culture on supply chain disruption management, there is minimal work exploring the impact of supply chain disruption management on organisational culture. Change within organisations, particularly in times of disruption, is innate, and discussing changes (to organisational culture and individual decision-making), specifically imposed by efforts to manage a supply chain disruption, is an important angle to explore. Additionally, while works do exist exploring the relationship of certain aspects of behavioural eco-

nomics and organisational culture to supply chain management in general [17,169,170], these applications are generally limited to specific theories (i.e., Transaction Cost Economics [144,171–173] or are limited to certain components of supply chain management (i.e., supplier relationship management [174–176], or enterprise management more broadly (i.e., risk management [93,177–183]. Meaning that further work remains, not only to explore the effects of COVID-19 on business practices and decisions, but also linking a number of these disparate theories together through the foundational concepts of decision making, and how organisational culture effects those decisions.

3.3. Crisis and Risk Management

In line with the increasing frequency and prevalence of supply chain disruptions, renewed attention has been paid to supply chain crisis management and risk management (with crisis management being considered a sub-category of risk management for the purposes of this piece). The literature has discussed the risks and crises imposed by the pandemic (including the role of uncertainty), risk analysis methods appropriate for the pandemic, the role of postponement, dual sourcing, and planning in managing supply chain risks and crises, as well as the formulation/description of mitigation tools that would be effective for managing disruptions, however, many of these works were published before the pandemic [118,135,184–196]. The above and other methods of managing risk are all considered by individual firms and supply chains as a whole through the lenses of risk appetite and risk culture. Risk appetite describes an organisation's willingness to accept a given risk in pursuit of its organisational objectives, whereas risk culture describes the values, attitudes, understanding, etc., of risks that a group of individuals share within organisations. This is particularly relevant to the challenge facing the supermarket food supply chains post-COVID: The dilemma is between reducing the risk of stock-outs in the event of similar disruptions in the future, at the cost either of higher safety stock levels or increased capability to respond to exceptional and rapid demand/supply imbalance or accepting the risk. In simple terms, the conflict is between a cost culture and a service culture.

Inter-Disciplinary Linkages/Research Gaps

Although the connections between crisis/risk management and the disciplines of behavioural economics and organisational culture may seem tenuous at first, the foundational concepts of risk appetite and risk culture highlight these linkages. Some discussion of risk appetite and risk attitudes, how important they are, and how they vary over time was had (albeit in a surface-level manner); these discussions were had outside the context of supply chain disruptions [197–203]. Aside from this, Kimbrough and Componation (2009) found that organic organisational cultures were associated with the successful implementation of risk management [182]. On the other hand, Griffith et al. (2010) linked various definitions of organisational culture to the definition of risk management, while Neal et al. (2012) suggested that bestowing employees with a sense of responsibility was highly important to the development of a consistent food safety culture [199,202]. In the context of enterprise risk management, Chen et al. (2019) found that cultural attributes, such as outcome orientation and innovation, played considerable roles in the development of an effective risk culture [178]. Moreover, Kurniawan et al. (2017) found that supply chain effectiveness and efficiency were enhanced by an organisational culture that positively influences supply chain visibility and supplier development [200]. Lastly, Martens and Rittenberg (2020) provides practical advice for managers and decision-makers, with their main recommendation being the implementation of a proper risk culture to maintain and reinforce their risk appetite [201].

3.4. Supply Chain Agility and Resilience

Globalised, lengthy, and lean supply chains, particularly within perishable and humanitarian chains, have been focused on in the literature discussing supply chain risk

management throughout the pandemic due to the severity and scope of the disruptions they faced [44,52,204–218]. In accordance with this, academicians have also paid special attention to building resilient and agile supply chains and how these approaches to supply chain management have benefited organisational performance throughout the pandemic. In this vein, many authors have discussed the role of uncertainty, supply chain integration, (macro) environmental factors, and elements of a supply chain's industry/sector, among many other factors, on not only supply chain and operational performance but also the development of more agile and resilient supply chains, predominantly outside the COVID-context [11,129,219–240].

Inter-Disciplinary Linkages/Research Gaps

Not many works have established a connection between behavioural economics and supply chain agility. One standout work in this regard was that of Yaroson et al. (2022), who found that power-based behaviours within the pharmaceutical supply chain were a detriment to both mitigation and recovery strategies [241]. Culture, on the other hand, was far more discussed in this context; however, the coverage remains quite limited. For instance, Alamsjah and Yunus (2022), who explored digitalisation efforts in Indonesian supply chains, found that ambidexterity was highly important to successful implementation due to its tendency to adopt paternalistic/founder-centric cultures that are not aligned with the digitalisation efforts [242]. Additionally, Ali et al. (2023) argue that supply chain resilience and dynamic capabilities are inspired by exposure to risks and that knowledge management precedes the inspiration of business changes [243]. Lastly. Siagian et al. (2021), among others, suggest that cultural changes would be required to support performance under disruptive conditions due to their impact on strategy, performance, and leadership [9,205,237,244–247].

3.5. Information Sharing and Collaboration

Information sharing and collaboration across the supply chain have been a topic of much discussion in recent decades, particularly concerning the development of agile supply chains, crisis/risk management, and supply chain disruption management. This is also true in the context of COVID-19, with a number of works exploring information sharing as an antecedent to the successful management of risks induced by supply chain disruptions resulting from the pandemic; the literature also discusses these elements, with collaboration acting as the antecedent to successful management. These two streams of literature have been consolidated into this section of the review, as it is widely accepted by academics in this area that successful supply chain collaboration necessitates effective communication and information sharing between echelons [30,104,109,117,118,248–251]. Most significantly, Al-Mansour and Al-Ajmi (2020) found that Human Resource Management played a crucial role in supply chain disruption management, particularly identifying information sharing and dissemination as crucially important; after all, uncertainty (and thus most crises) can only be resolved through the gathering, analysis, and dissemination of information [42,118,141,251].

Inter-Disciplinary Linkages/Research Gaps

Many behavioural economic concepts are founded upon the human interpretation of information (i.e., bounded rationality, prospect theory, heuristics), some of which have already been applied to business-related decisions (i.e., transaction cost economics, behavioural theory of the firm) [96,100,156,252–257]. Notably, Shiralkar et al. (2022) highlighted the inadequacies of many supplier segmentation methods, citing imperfect knowledge that was required to properly utilise them; this acknowledges that business decision-makers are boundedly rational and have access to imperfect information [258]. On the other hand, organisational culture was linked to information sharing far less. One article from Arunprasad et al. (2021) was an extensive literature review discussing remote work, with information sharing only taking a minor role in the discussion [259]. Another article from Kumar and Anbanandam (2020) discusses information sharing in the context of maintain-

ing a consistent risk culture within the firm, essentially highlighting that employees should be encouraged to report risk-related information [260]. Such limited and basic coverage is a major gap in the current state of knowledge.

3.6. Industry 4.0/Technological Innovations

Over the last decade, Industry 4.0 technologies and other technological innovations have been developed to aid organisations with various components of supply chain and operations management, including some listed above (i.e., crisis/risk management, risk management, information sharing, supply chain agility/resilience) [224,261–264]. Some examples of Industry 4.0 technologies include blockchain, the Internet of Things, Cyber-Physical systems, smart factories and sensors, artificial intelligence, and cloud computing, however, this is far from an exhaustive list. In addition to their general benefits, the role of these technologies in mitigating and recovering from the pandemic has been well-covered by the literature. The existing literature has also discussed the risks of implementing such technologies, both outside and within the context of COVID-19, with two primary examples being upfront and long-term costs and implementation difficulties leading to extrapolated risks (i.e., production slowdown/stoppage and reduced operational efficiency during implementation) [23,33,155,262,265–284].

Inter-Disciplinary Linkages/Research Gaps

Although Industry 4.0 is one of the more-discussed topics within the literature, even within the context of COVID-19, there is little work linking the topic to behavioural economics and organisational culture. Firstly, there is minimal work exploring how organisational culture may inhibit or encourage the implementation of Industry 4.0 technologies. Similarly, there is no work exploring the reasons behind such implementations outside of the tangible benefits and fund availability. For instance, only two authors have explored the role of bounded rationality and decoupling in the implementation of Big Data Analytics and other Industry 4.0 technologies [285,286].

Comparatively, the digitalisation of the supply chain has been discussed in relation to organisational culture far more; however, much of the current state of knowledge is focused on how cultures can support implementation rather than the impact of implementation on culture [241,287–290]. For instance, Gupta et al. (2021) developed a readiness framework for the development of human resources that would facilitate the digitalisation of their operations; Alamsjah and Yunus (2022) identified organisational culture as a critical factor that would support the digitalisation of the supply chain [242,289]. It is worth noting, however, that none of these examples consider the context of a supply chain disruption. One notable exception to the above is the work by Galanakis (2020), which considers various innovations that could be beneficial throughout the COVID-19 context; they argue that the development and promotion of a "food safety culture" would complement the implementation of said technologies [210].

3.7. Leadership (Internal Supply Chain)

A crucial component of organisational culture, leadership, has been discussed in much greater depth than organisational culture itself in the specific context of COVID-19 (aside from the exceptions previously discussed). Appropriate leadership is commonly regarded as an antecedent to operational performance, particularly in times of crisis or disruption, due to its ability to link workers and their goals to organisational objectives and day-to-day operations; this makes it a highly important topic of discussion in the context of COVID-19. However, much of the work in this area has primarily discussed surface-level components of the topic, such as the cruciality of leadership, reflections on the actions of leaders, and how leadership impacted the firm-level responses throughout the duration of the pandemic and other disruptions [2,291–298]. Otherwise, much of the literature discusses how leadership (most commonly, transformational leadership) impacted employee well-being and performance throughout the pandemic [299–302]. A

much smaller sect of the research discusses gendered leadership, particularly focusing on difficulties in female leadership roles and lessons that could be learned from female heads of state [299,303].

Inter-Disciplinary Linkages/Research Gaps

In relation to behavioural economics, only one article explored the role of leadership behaviours in behavioural theory of the firm in a disruption context, finding that organisational mindfulness and social learning positively affected opportunistic behaviour [304]. Similarly, only one article explored the mediating role of organisational culture in how leadership styles affected employee performance, finding that transformational leadership, particularly when paired with cohesive and supportive organisational cultures, overwhelmingly supported employee performance [301]. This is a substantial gap in the current state of knowledge; further work is needed to understand leadership from a supply chain disruption management perspective, as well as from a multi-echelon perspective.

4. Discussion

4.1. Justifications for Future Research in Relation to Supply Chain Disruption Management

4.1.1. Effect of COVID-19 on Businesses

As noted above, only a few standalone works explore the effect of supply chain disruptions, particularly COVID-19, on businesses through the lens of behavioural economics and organisational culture. Exploring how COVID-19 has affected businesses in these ways would not only contribute to the literature discussing the effects of COVID-19 but would further the advancement of the fields of organisational culture and behavioural economics. In doing so, implications could be generated for practitioners in order to guide them through supply chain disruptions, much in the same way that behavioural economics has long been utilised to formulate implications for marketing practitioners and policy-makers. Similarly, further knowledge regarding how organisational cultures (rather than national cultures) change as a result of a disruption (rather than planned change) is required to fully understand the effects of the pandemic (and other disruptions) on businesses.

4.1.2. Crisis and Risk Management

Within businesses, which risks are to be avoided or engaged with is decided, both by individuals and groups of individuals; concepts such as risk appetite and risk culture aim to explain why such decisions are made and guide organisations towards making better decisions under risk. The application of behavioural economics to the risk appetite concept has been largely unexplored; this is fascinating due to how the concepts of loss and risk aversion could easily be applied to how organisations formulate their risk appetite plans and how those plans are enacted in real-time. Similarly, the literature discusses how risk culture and risk governance impact organisational performance and how organisational culture informs risk-laden decisions, but there is minimal work exploring how organisational culture informs risk culture specifically.

4.1.3. Supply Chain Agility and Resilience

The decisions to implement, develop, and manage agile/resilient supply chains are largely viewed through the lens of neo-classical economics. A behavioural approach to explaining such decisions would allow for a more nuanced discussion of why and how organisations choose to adapt their supply chains into those that are more agile in nature. Additionally, the role of organisational and inter-organisational cultures could also play a role in how adaptations to more resilient supply chain strategies are viewed, how much they are accepted, and, in turn, how they are implemented in practice. However, the academic literature has ignored these elements when it comes to explaining the reasons behind choosing and implementing changes regarding supply chain management strategies. This would be a useful angle to explore, as it would enable academicians to explain supply chain decisions more completely, as well as allow practitioners to understand how these dynamics

would impact their own supply chain adaptation strategies; with the need for balance between increased cost and increased resilience, as previously described, understanding both the mathematical and behavioural factors impacting such decisions is critical.

4.1.4. Information Sharing/Collaboration

Organisations must be careful in deciding what and how much information to share, which supply chain members they are sharing with, and when to make this information available to the relevant parties, as it could lead to a competitive disadvantage. Because these decisions are made by individuals and groups of individuals who are unable to make rational decisions, even at the best of times, the role of behavioural economic concepts becomes highly pertinent to explain the rationale behind such decisions. These explanations, considered in tandem with the outcomes of said decisions, could provide examples of success stories and cautionary tales to practitioners, allowing them to be more cognisant of their decisions and their possible impacts, be they positive or negative. This is also true for decisions that are made by groups of individuals and the effects of organisational culture and group dynamics on said choices.

4.1.5. Industry 4.0

As mentioned previously, people are unable to engage with rational decisions as defined by neo-classical economics, and exploring the roles of loss and risk aversion, among other behavioural-economic concepts, in the decision to implement Industry 4.0 technologies is highly important. On the other hand, there is a noticeable lack of work exploring how Industry 4.0 applications impact organisational culture and individual decision-making from a behavioural perspective. Understanding the dynamics that facilitate and the dynamics that would be changed by Industry 4.0 implementation deserves to be better understood from a theoretical perspective; practically speaking, these insights would facilitate the implementation of and ensure cultural compatibility with these technologies. This would, in turn, allow for easier attainment of the performance and relational benefits Industry 4.0 technologies are notable for.

4.1.6. Leadership

Despite leadership being more widely discussed, there is still minimal work linking it to organisational culture and behavioural economics. Such superficial coverage of leadership presents challenges for company seniors, as the literature essentially states that "appropriate leadership is important" but does not elaborate on how to be a successful leader under disruptive circumstances. In this regard, further work could be conducted to explore the relationship between leadership and organisational culture in terms of the firms' responses to COVID-19 and other supply chain disruptions. This is also true in terms of studying the relationship between leadership and individual decision-making capabilities with respect to the pandemic. On the other hand, more work needs to be done to study the reasons behind which leadership styles were adopted by professionals at certain points of the pandemic through the theoretical lenses of behavioural decision-making and organisational culture. Additionally, like most discussions of leadership, the discussion has been largely limited to leadership within the context of a singular focal firm; further work is needed to explore the effects of leadership on an inter-organisational basis.

4.1.7. Overall

If these subjects were to be explored in more depth, we would have more complete understandings of how businesses make decisions under a supply chain disruption, which could facilitate the implementation of improved decision-making models and organisational cultures. This would, in turn, lead to improved performance and supplier relationships.

4.2. Future Research Directions

The below table is a summary of future research directions proposed by this piece (as above). Some are rather specific, and others will require further development from those researchers wanting to engage with them. The first column of the table is the main subject area (as listed in the headings above); the second column refers to whether the inter-disciplinary link is to behavioural economics or organisational culture; the third column is the research direction/question itself; the following column indicates whether the research question is valuable to explore within or outside the context of COVID-19 and/or other disruptions; the next series of columns (Single-Firm, Inter-Echelon, and Multi-Sectoral Analysis) are designed to indicate what scope of research would be beneficial for a singular study to investigate for a given question. The research questions and the resulting table have been created using a common-sense approach after exploring the current state of knowledge and research gaps, as presented above; this table is designed to act as a summative tool (Table 2).

Table 2. Proposed Future Research Directions/Questions.

Categorical/ Subject Area	Inter-Disciplinary Linkage	Research Directions/ Possible Research Questions	COVID Context	Non-COVID Context	Single-Firm Analysis	Inter-Echelon Analysis	Multi-Sectoral Analysis
Effects of COVID on Business	Behavioural Economics	How did theories of behavioural economics (i.e., loss/risk aversion) in individuals in business contexts change?	Yes	No	Yes	Method-Dependent	Method-Dependent
Effects of COVID on Business	Organisational Culture	How did organisational culture change/shift?	Yes	No	Yes	Yes	Method-Dependent
Supply Chain Disruption Management	Behavioural Economics	How did theories of behavioural economics (i.e., loss/risk aversion) affect supply chain disruption management; what were the outcomes of these decisions?	Yes	Yes * (Other disruptions)	Yes	Yes	Method-Dependent
Supply Chain Disruption Management	Behavioural Economics	How did supply chain disruption management impact professionals through the lens of theories of behavioural economics (i.e., loss/risk aversion)?	Yes	Yes * (Other disruptions)	Yes	Yes	Method-Dependent
Supply Chain Disruption Management	Organisational Culture	How did organisational culture affect supply chain disruption management; what were the outcomes of these decisions?	Yes	Yes * (Other disruptions)	Yes	Method-Dependent	Method-Dependent
Supply Chain Disruption Mgt	Organisational Culture	How did supply chain disruption management affect organisational culture?	Yes	Yes * (Other disruptions)	Yes	Method-Dependent	Method-Dependent
Supply Chain Disruption Management	Other	Which timeline-categorical frameworks are appropriate for which disruptions?	Yes * (Other disruptions too)	Yes * (COVID-context needed)	Yes	Yes	Yes
Supply Chain Disruption Mgt	Other	What are the general phases of various disruptions?	Yes * (Other disruptions too)	Yes * (COVID-context needed)	Yes	Yes	Yes
Crisis and Risk Management	Behavioural Economics	What role do theories of behavioural economics (i.e., loss/risk aversion) play in the formulation and implementation of risk appetite plans?	Yes * (Or other severe disruptions)	Yes	Yes	Method-Dependent	Method-Dependent
Crisis and Risk Management	Organisational Culture	How does organisational culture inform risk culture?	Yes * (Or other severe disruptions)	Yes	Yes	Method-Dependent	Method-Dependent
Supply Chain Agility/Resilience	Behavioural Economics	Why/How did organisations decide to implement agile/resilient supply chains through the lens of theories of behavioural economics (i.e., loss/risk aversion); what were the outcomes of these decisions?	Yes	Yes	Yes	Yes	Method-Dependent
Supply Chain Agility/Resilience	Organisational Culture	What role did organisational culture play in the decision to implement agile/resilient supply chains; what were the outcomes of these decisions?	Yes	Yes	Yes	Yes	Method-Dependent

Table 2. *Cont.*

Categorical/ Subject Area	Inter-Disciplinary Linkage	Research Directions/ Possible Research Questions	COVID Context	Non-COVID Context	Single-Firm Analysis	Inter-Echelon Analysis	Multi-Sectoral Analysis
Information Sharing and Collaboration	Behavioural Economics	How did theories of behavioural economics (i.e., loss/risk aversion) affect information-sharing decisions; what were the outcomes of these decisions?	Yes	Yes	Yes	Yes	Method-Dependent
Information Sharing and Collaboration	Organisational Culture	How did organisational culture affect information-sharing decisions; what were the outcomes of these decisions?	Yes	Yes	Yes	Yes	Method-Dependent
Industry 4.0/Technological Innovations	Behavioural Economics	How did theories of behavioural economics (i.e., loss/risk aversion) affect decisions to implement technological innovations; what were the outcomes of these decisions?	Yes	Yes	Yes	Method-Dependent	Method-Dependent
Industry 4.0/Technological Innovations	Behavioural Economics	How did the implementation of technological innovations affect theories of behavioural economics (i.e., loss/risk aversion) in individuals?	Yes	Yes	Yes	Method-Dependent	Method-Dependent
Industry 4.0/Technological Innovations	Organisational Culture	How did organisational culture affect decisions to implement technological innovations; what were the outcomes of these decisions?	Yes	Yes	Yes	Method-Dependent	Method-Dependent
Industry 4.0/Technological Innovations	Organisational Culture	How did the implementation of technological innovations affect organisational culture?	Yes	Yes	Yes	Method-Dependent	Method-Dependent
Leadership	Behavioural Economics	How did leadership impact theories of behavioural economics (i.e., loss/risk aversion) in individuals; what were the outcomes of these decisions?	Yes	Yes	Yes	Method-Dependent	Method-Dependent
Leadership	Behavioural Economics	Why did leaders adopt certain styles throughout the pandemic; how effective were the chosen styles for each stage at positively influencing theories of behavioural economics (i.e., loss/risk aversion) in individuals?	Yes	Yes * (Other disruptions)	Yes	Method-Dependent	Method-Dependent
Leadership	Behavioural Economics	How did leadership impact theories of behavioural economics (i.e., loss/risk aversion) in individuals on an inter-organisational basis; what were the outcomes of these decisions?	Yes	Yes	No	Yes	Method-Dependent
Leadership	Organisational Culture	How did leadership impact organisational culture and group decision faculties; what were the outcomes of these decisions?	Yes	Yes	Yes	Method-Dependent	Method-Dependent
Leadership	Organisational Culture	Why did leaders adopt certain styles throughout different phases of the pandemic; how effective were the chosen styles for each stage at positively influencing organisational culture and group decision faculties?	Yes	Yes * (Other disruptions)	Yes	Method-Dependent	Method-Dependent
Leadership	Organisational Culture	How did leadership impact organisational culture and group decision faculties on an inter-organisational basis; what were the outcomes of these decisions?	Yes	Yes	No	Yes	Method-Dependent

5. Summary and Conclusions

5.1. Conclusions

Organisations are constantly faced with decisions to be made both as groups and individuals; these decisions are far-reaching, covering many areas (i.e., how to immediately respond to a disruption, how to manage risks and crises in the long-term, how agile/resilient to make the supply chain, decisions surrounding information sharing and collaboration (i.e., what, how much, who with, when, and why), technological implementation decisions, and how to lead during a time of crisis), making underlying concepts of how

and why people make decisions (i.e., behavioural economics and organisational culture) highly important to engage with. However, these two areas have been largely neglected by the literature, particularly in the context of COVID-19. This work has utilised a systematic literature review to explore the current linkages between these theories, which ultimately resulted in the generation of several research directions. Overall, seven critical areas of the supply chain disruption management literature were explored in relation to behavioural economics and organisational culture; it was found that some works were beginning to explore these linkages, but also that much work remained in each area.

It has long been acknowledged that neo-classical perspectives do not encapsulate the inherent irrationality that human decision makers are laden with; however, work discussing these factors in the context of organisational decisions is still very limited. Similarly, organisational culture has long been acknowledged as a critical component of organisational performance; there has been minimal exploration of organisational culture in relation to supply chain disruptions. Exploring the linkages between these concepts in more depth would allow for more complete explanations of decisions that were regarded as highly critical throughout disruptions from a theoretical perspective. These theoretical insights could then be utilised by practitioners to encourage more effective decision-making given a supply chain disruption, which, in turn, would inspire speedier recoveries (or faster establishments of the "new normal") alongside improvements in operational and supply chain performance. This work originally contributes to this body of work through the identification of the linkages already presented in the literature and the generation of future research directions.

The paper discusses the effects of COVID-19 on businesses, particularly focusing on its impact on various sectors, supply chains, and business management. Lockdowns and shelter-in-place orders have significantly altered international business operations by restricting the movement of people and goods. Different sectors face distinct challenges, with some experiencing decreased demand (e.g., hospitality, tourism, automotive) and others dealing with inflated yet uncertain demand (e.g., grocery, humanitarian, medical supply chains). The literature extensively explores these disruptions, but there is minimal attention given to the effects of lockdowns, uncertain supply/demand conditions, and logistical difficulties on decision-making capabilities within a business context. The text also discusses the literature on supply chain disruption management, crisis and risk management, supply chain agility and resilience, information sharing, collaboration, technological innovations (Industry 4.0), and leadership during the pandemic. However, it highlights research gaps, particularly the limited exploration of the connections between these topics and behavioural economics or organisational culture. Further research is needed to understand how decision-making, culture, and leadership intersect with supply chain disruptions.

5.2. Limitations

Like any research work, this one is not without its limitations. The primary limitation of this work is the lack of critical appraisal of the research employed, meaning that all sources of knowledge were treated as equally true despite the measurement of their quality through various metrics. However, this was largely due to the lack of relevant works in each of these areas, leading to no exclusionary criteria being established. Additionally, the literature review was systematically conducted. However, the process was not well documented, leading to difficulties describing the process of extracting and analysing the data; generally, the authors would conceptualise it as a general notetaking and summation approach. This has notable implications for the replicability of this work and, thus, validity and reliability. Future research on the linkages between these theories would benefit from adopting more empirical approaches, both in terms of secondary and primary research.

5.3. Future Research Directions

Overall, the major contribution of this work is the proposed future research directions, as outlined in Table 2 in Section 4.2. Ultimately, to summarise the recommendations made, it was proposed that behavioural economics and organisational culture be examined in relation to seven critical areas of supply chain disruption management. These seven areas consisted of the effects of COVID-19 (and other supply chain disruptions) on businesses/supply chains, supply chain disruption management, crisis and risk management, supply chain agility and resilience, information sharing and collaboration, industry 4.0 and technological innovations, and leadership (particularly crisis leadership). Although some work has been conducted in line with the recommendations of this work, they are scant and often limited to literature reviews. In addition to the theoretical inter-disciplinary applications, it was recommended that research be conducted within and outside the context of supply chain disruptions (including COVID-19) and at various levels of scope (i.e., single-firm, across one supply chain, and across multiple supply chains in different sectors).

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