

A Systematic Literature Review on Sustainability and Disruptions in Supply Chains



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Abstract The purpose of this paper is to provide the state-of-the-art of the theme: ‘sustainability and disruptions in supply chains’. The main motivation for the research was to identify the level of connectivity between these apparent separate topics and identify gaps for carrying out future research. A systematic literature review was carried out, searching the World of Science database, 76 papers were selected for analysis. The main database consulted was Web of Science for the period 2000–2016. The articles were classified according to their year of publication, country/region focus of study, citation, journal name, for example. Then the tallies of each group were collected into a MS Excel file in order to do a series of analyses, plot graphs and make comparisons. The findings point out that the *International Journal of Production Economics* leads the way in terms of publishing work on this theme. Most of the published work comes from North-America and Europe, however China also features highly in the ranks. The ‘sustainability’ literature included topics of: positive relation between sustainable supply chain management and economic and environmental performance. The disruptions literature included topics of: information sharing, inventory management and multiple suppliers. Some scarce combination of sustainability and disruptions was found.

Keywords Sustainability · Disruptions · Supply chains

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1 Introduction

Disruptions can have devastating effects on individuals, organisations and the wider economy which is why it is imperative that organisations evaluate their supply chain (SC) vulnerabilities. Though disruptions are varying in definition, Wilson [84] defines them as events which disturb the flow of resources in a SC, subsequently leading to an unexpected pause in the movement of goods.

Unexpected disruptions (UD), specifically low frequency and high impact UD can have substantial effect on business, environment and society at large. With the rise of a globalized economy, supply chains are becoming increasingly complex and interconnected with global sourcing on a rise [32].

Mitroff and Alpaslan [3] found, in a study conducted over two decades that from the fortune 500 companies, that only between 5 and 25% organisations were prepared to deal with disruptions. Furthermore, as this area of research is still to mature, there is little evidence of research which has combined the effects of disruptions with the three sustainability metrics: economic, environmental and social. Therefore, this paper seeks to add to research area by combining these two topics.

2 Methods

The systematic literature review methodology was employed [6]. The Web of Science database was searched with inclusion of 3* and 4* ABS journals [23]. The search term (Disruption OR disaster OR emergenc* OR cris*) AND (Sustainab* OR green OR environ* OR resilience OR robustness) AND (Measur* OR manag* OR quant*) AND (Supply OR network OR chain) was used between the years 2000–2016.

This search retrieved 1465 papers which, when refined into the research domain of social sciences resulted in 525 papers. The search was further refined into the research area of operations research management which produced 167 papers, operations research management was the most applicable grouping in the Web of Science for this paper. After this stage, the abstracts and relevant titles were examined to decide their suitability with the paper which led to 76 papers academic peer-reviewed journal articles from 28 different journals and conference papers which reflected great significance to our research paper (See Appendix). The use of conference papers demonstrates that this is a developing topic. See Fig. 1.

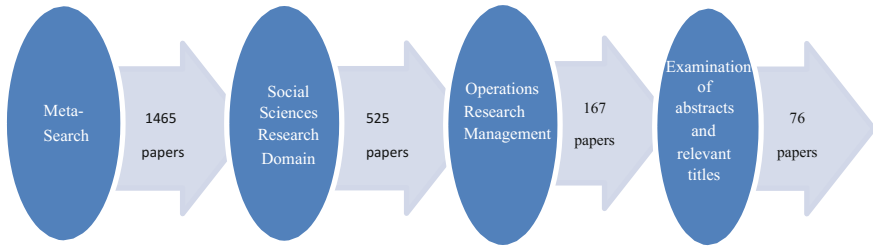


Fig. 1 Screening methodology

3 Findings

Table 1 illustrates the top ten journals where papers regarding UD and sustainability have been published. The *International Journal of Production Economics* leads the way with 16 publications, more than five times the 10th journal, i.e. *Transportation Research*. Table 2 represents the geographic variety of scholars’ affiliations. The concentration of affiliations is primarily in North America (57%), followed by Europe and Australia (33%). However, publications from scholars in China, Malaysia, Philippines and Iran (10%) show that this topic is not only of interest to the Western world. Figure 2 represents keywords used by authors with risk management and SCM gaining 37 hits and 36 hits respectively while GSCM only gains 11 hits.

Table 1 Ranking of journals by number of publications

	Journal title	Publications
1	International Journal of Production Economics	16
2	Journal of Operations Management	5
3	Production and Operations Management	5
4	OMEGA—International Journal of Management Sciences	4
5	International Journal of Physical Distribution and Logistics Management	4
6	MIT Sloan Management Review	4
7	International Journal of Operations and Production Management	4
8	International Journal of Production Research	4
9	European Journal of Operational Research	3
10	Transportation Research Parts B and E	3

Table 2 Geography of scholars' affiliations by first author

	Country	Publications
1	USA	39
2	UK	8
3	Germany	7
4	China	5
5	Canada	4
6	France	3
7	Austria	2
8	Australia	1
9	Poland	1
10	Malaysia	1
11	Philippines	1
12	Switzerland	1
13	Iran	1
14	Portugal	1
15	The Netherlands	1

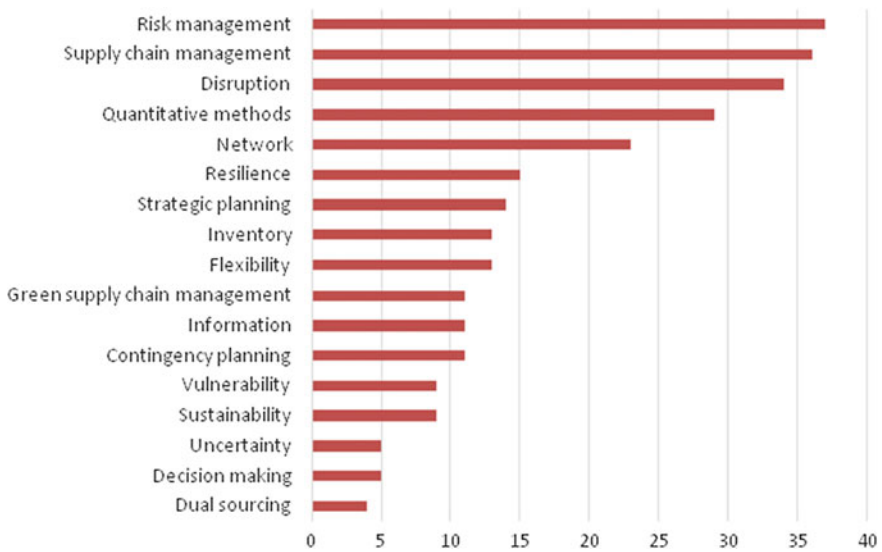


Fig. 2 Frequency of keywords used by authors

3.1 Disruption

Research on disruption has shifted from a short-term approach emphasising the requirement to prevent and protect an organisation against disruptions to a

Table 3 Techniques of responding to large-scale UD

Authors	Collaboration	Multiple suppliers	Information sharing	Management culture	Inventory management	Decision making
Christopher and Peck [26]	X	X	X	X	X	X
Kleindorfer and Saad [43]	X	X	X		X	X
Tang [70]	X	X				
Knemeyer et al. [46]	X	X	X	X	X	X
Schmitt and Singh [60]					X	
Chopra and Sodhi [24]		X			X	

longer-term approach, which identifies disruptions and fortifies the organisations preparedness, so that it can build resilience against these disruption risks [5].

Table 3 demonstrates the different techniques studied by researchers of responding to large-scale UD. As supply chains are becoming increasingly interconnected due to factors, such as globalisation, the effects of disruptions are increasingly extensive and can go beyond the immediate area of disruption stretching across an entire supply network. However, the entire supply network may not be visible to an organisation, therefore reducing the complexity in the supply network is ever more challenging [8, 49, 86]. There is a thorough investigation of disruptions in the literature and researchers have suggested strategies based on the source of risk, e.g. Kleindorfer and Saad [43] state that risk may arise from problems in coordinating supply and demand or from a disruption to normal events. In devising optimal strategies, studies establish strategies based on the risk status of an organisations e.g. risk-averse or risk-taking. Conceptual frameworks suggested by Kleindrofer and Saad [43] and Christopher and Peck [26] show the stages in preparing an organisation to deal with UD, such as classifying risks and documentation of procedures.

Researchers have advanced on these conceptual frameworks by developing quantitative and qualitative techniques to understand how an organisation can respond to UD, e.g. through information sharing between organisations across the entire SC for increasing resilience towards disruption [7, 27, 33, 34, 72]. Kleindorfer and Saad [43] state information sharing among partners in the SC is crucial for successful preparation and response to potential disasters, they suggest the level of investment contributed towards reliable information gathering and sharing should be based on the probability of a disruption occurring and the predicted losses if investment into information sharing was not made. Although researchers stress the importance of information sharing by stating that the unwillingness to share information causes defects in existing business models, the technicalities, such as the network through which information should be transmitted, received and stored are either limited or non-existent [2, 9].

Knemeyer et al. [46] propose a four-step proactive framework which is identified as an extension of Kleindorfer and Saad's [46] framework. Although these frameworks provide a practical guidance for organisations to improve their preparedness for an UD, they will require extensive use of resources therefore applying them in industry may be problematic as a Zurich Insurance [11] report reveals over 55% of organisations do not regularly monitor risk in their SC due to lack of time.

3.2 Sustainability

The literature on sustainability has shifted from being viewed as a trade-off between expenses and economic growth to being vital for an organisation in order to grow and remain competitive [4, 44]. While there has been growing research on the notion of SSCM and increasing pressures on organisations to integrate the three sustainability metrics: economic, environmental and social into their operations, little emphasis has been given to sustainability in relation to disruptions [44]. Many researchers [10, 17, 29, 88] recognise the economic and environmental aspect of sustainability while little regard is given to the social aspect. They all believe that organisations competitiveness can be improved through its internal strategy by cost reduction through the implementation of sustainable strategies. Bowen et al. [17] developed a model which included a two-phase survey conducted with public limited companies in the UK, they state that improving the 'literacy' of the purchasing personnel in an organisation can improve an organisations economic and environmental stance through the reduction of material use and waste which ultimately reducing. Adding to this, Cruz and Matsypura [29] develop a framework in their study which evidences that improved decision-making through taking into account sustainability can reduce an organisations transaction costs and waste.

3.3 Combining Both Disruptions and Sustainability in SCs

Although combining SCD and SCS is scarce in the literature, few researchers have recently attempted to combine both topics [1, 5, 36, 39, 56]. The papers by Hofmann et al. [39] and Gonzalez et al. [36] are published in journals whereas the remaining papers were published at conferences indicating that this topic is in its early stages. Rush et al. [56] investigate the rebuilding of sustainable communities for families and children post disruption and provide recommendations such as making assembling disaster kits which include necessities such as water and a flashlight, providing 'community safe houses' where residents can go if bad weather arises and assigning different roles to local communities if a disruption occurs. Although this paper provides recommendations for communities in case of disruptions, it has not been backed up by quantifiable evidence or testing of any sort

such as simulation to check whether it would be practical in theory. Hofmann et al. [39] study how SC disruptions can arise from sustainability issues, for example, some of Apple's suppliers in China have almost destructive working conditions for their employees which presented Apple with a wave of negative publicity.

4 Discussion and Conclusions

Although the sustainability agenda is gaining traction in many corners in Operations and SCs, evidence of fully sustainable implementation (i.e. all dimensions given equal importance) is still work in progress. Furthermore, scholars and practitioners alike are in need of going beyond the Triple Bottom Line in terms of measuring sustainability performance, so new models, frameworks and methodologies should be proposed to enthruse and achieve sustainability and resilience in SCs.

Some key findings are listed below:

- The literature on disruptions is more rigorously studied with prominent frameworks provided by researchers such as Kleindorfer and Saad [43].
- Within the disruption literature, the focus of has been on using quantitative methods to investigate economic effects and service level of SC strategies in case of disruption with less emphasis on environmental and social dimensions.
- The literature regarding disruption is very much concentrated on research carried out in Western countries whereas the literature on sustainable SCM is more geographically diverse.

In concluding, this paper presents a systematic literature review that could be used for future research. Although the number of publications have steadily increased in the last few years for each separate topic, i.e. 'sustainability' and 'disruptions' in SC, there is still a gap in terms of publications combining both topics in mainstream operations and supply chain management publications. In terms of sustainability, the focus has been mainly on Economic and more recently on Environmental dimensions with less emphasis on the Social dimension. In terms of disruptions, the focus is on SCRM and various frameworks for organizations to address, mitigate and respond in the face of SC disruptions.

One of the limitations of this paper is that although a systematic literature review has been carried out, there may be publications which may have been missed out due to not being listed in Web of Science database. Moreover, the search term used may have not captured all possible synonymous terms by which scholars publish their work.

Future research avenues will consider pursuing the data collection of relevant case studies to better explore and understand the combined interaction between supply chain disruptions and sustainability. Furthermore, a survey questionnaire could be designed for managers to test some propositions deriving from the case studies.

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