Journal of Transport and Supply Chain Management
ISSN: (Online) 1995-5235, (Print) 2310-8789

Supply chain disruptions: Insights from South African third-party logistics service providers and clients

Authors:
Jaco Nel[1]
Evert de Goede[1]
Wesley Niemann[1]

Affiliations:
[1]Department of Business Management, University of Pretoria, South Africa

Corresponding author:
Wesley Niemann,
wesley.niemann@up.ac.za

Dates:
Received: 18 Feb. 2018
Accepted: 03 May 2018
Published: 14 June 2018

How to cite this article:
Nel, J., De Goede, E. & Niemann, W., 2018, 'Supply chain disruptions: Insights from South African third-party logistics service providers and clients', *Journal of Transport and Supply Chain Management* 12(0), a377. https://doi.org/10.4102/jtscm.v12i0.377

Background: Despite risk management efforts, supply chains have become increasingly vulnerable to disruptions. Disruptions should be successfully managed if organisations are to thrive in today's ever-changing world.

Purpose: This study explored supply chain disruptions of third-party logistics service providers (3PLs) and their clients based in South Africa by investigating the disruptions these organisations face, and how they go about managing them.

Method: A generic qualitative research approach was used to gather data by conducting semi-structured interviews with 22 participants, which comprised 11 3PLs and 11 client organisations operating in South Africa.

Findings: This study classified disruptions as intra-, inter- and extra-organisational. South African 3PLs and their clients face the majority of their disruptions either intra- or inter-organisationally. The focus of 3PLs and clients has shifted from risk management to disruption management. The findings show that 3PLs and their clients based in South Africa prefer disruption learning over traditional risk management as a method to better manage future disruptions.

Conclusion: This study contributes to existing literature by providing insight into the specific supply chain disruptions that 3PLs and their clients based in South Africa face, according to the disruption location in the supply chain and how 3PLs and clients manage supply chain disruptions.

Introduction and problem statement

Globalisation, the reduction of the supply base, just-in-time practices, outsourcing, agile practices and artificial intelligence have been cited as key trends within the supply chain management sphere (Behdani et al. 2012; Cerris 2016). Although these trends have made supply chains more efficient and effective, they have also increased the vulnerability of supply chains to various disruptions as they become part of a highly dependent network (Blackhurst et al. 2005:4068; Oke & Gopalakrishnan 2009:168; Sheffi 2015:32).

Several academic articles and industry reports have highlighted the different disruptions that the world as a whole, organisations and supply chains face (Blackhurst, Scheibe & Johnson 2008:143; McKinnon 2006:228; Mitroff & Alpaslan 2003:10; Stecke & Kumar 2009:194; World Economic Forum 2016). From these sources, it is shown that disruptions can take place in various locations relative to the organisation, starting with intra-organisational disruptions, such as strikes; inter-organisational disruptions, such as customs delays; and within the extra-organisational environment, such as new regulations and natural disasters (Behdani 2013; Christopher & Peck 2004:6; Sodhi & Lee 2007:1430).

In an international survey on the sources and consequences of supply chain disruptions, the Business Continuity Institute (2014) only reported the top five disruptions for organisations in sub-Saharan Africa. These include transport network disruptions as number one, followed by the volatility of currency exchange rates, civil unrest and/or conflict, loss of talent and/or skills and finally, outsourcing service failure.

The Business Continuity Institute (2014) also reported the five top-ranked disruptions in 11 regions across the world. The top disruption in six regions, including Europe, the United Kingdom,

Canada and Australia, was information technology (IT) or telecommunication outages. Four regions, including the Middle East, North Africa and Asia, listed adverse weather as the biggest disruption. Only sub-Saharan Africa listed transportation network disruptions as their top-ranked disruption. After examining the above report, it can be argued that the disruptions in sub-Saharan Africa differ from all the other regions mentioned in the report. A thorough search on specialist databases such as Google Scholar and SABINET revealed no academic work that focusses on supply chain disruptions in Southern Africa, a subset of sub-Saharan Africa, highlighting the need for such a study.

The context of this study is the 3PL industry, particularly the disruptions that 3PLs and their clients face. Organisations based in South Africa tend to parallel the global trend of increasingly outsourcing non-core activities such as logistics. Third-party logistics are involved in supply chains across numerous industries; thus, this study can provide a holistic picture of supply chain disruptions faced by 3PLs and clients based in South Africa (Foulds 2013:32). A variety of academic research has focussed on disruptions in different industries, including retail (Oke & Gopalakrishnan 2009:168–174), chemical (Kleindorfer & Saad 2005:53–68), automotive (Thun & Hoenig 2011:242–249), industrial (Wagner & Bode 2008:307–325), fast-moving consumer goods (FMCG) (Agigi, Niemann & Kotzé 2016:1–15; Simba et al. 2017:1–13), petrochemical (Botes, Niemann & Kotze 2017:183–199) and the toy industry (Johnson 2001:106–124). However, no research focussing on specific disruptions within the 3PL industry was found. In addition, disruptions and the associated risk differs between industries, therefore generalisability cannot be applied. This highlights a motivation for this study to focus on the 3PL industry (Oke & Gopalakrishnan 2009:171–174).

Thus, the purpose of this generic qualitative study was to explore supply chain disruptions that 3PLs and their clients based in South Africa face, by addressing the following two research questions:

- What supply chain disruptions do 3PLs and their clients based in South Africa face?
- How do 3PLs and their clients based in South Africa manage supply chain disruptions?

This study contributes to existing literature by providing insight into the specific supply chain disruptions that 3PLs and their clients based in South Africa face, according to the disruption location in the supply chain; which is intra-, inter- or extra-organisational. When an organisation is aware of the risk of various disruptions within its supply chain, it is better able to select the best mitigation strategy for each disruption, leading to more effective disruption management (Blackhurst et al. 2005:4073–4078). By categorising disruptions according to the type and severity, planning and communication between the different parties involved could be enhanced, which leads to faster and better decision-making (Macdonald & Corsi 2013:279; Stecke & Kumar 2009:193–226). Insight into the specific disruptions that organisations are exposed to, help practitioners to be better prepared, as they can develop management strategies for specific disruptions. This enables practitioners to provide an improved service to their client and the end user in the supply chain, as they are able to manage disruptions faster and more effectively.

This article firstly reviews the available literature on 3PLs, supply chain disruptions and supply chain disruption management. This is followed by a description of the methodology. Thereafter, a report of the study's findings is provided, followed by a conclusion which describes the theoretical and managerial implications of the study. Finally, the study's limitations and proposed directions for future research are conferred.

Literature review

Third-party logistics service providers

The importance of logistics services in South Africa is emphasised by the amount spent on logistics costs, which constitutes 11.8% of South Africa's gross domestic product (GDP) (Havenga et al. 2016:1–14). South Africa is the most developed country in Africa in terms of the contract logistics (3PL) market. South African organisations parallel the global trend of outsourcing logistics management activities, with the result that the majority of logistics activities are performed by 3PL service providers (Analytiqa 2013; Foulds 2013:32). A 3PL can be defined as 'an external supplier that performs or manages the performance of all or part of a company's logistics functions' (Coyle et al. 2013:489). This definition is purposefully broad and encompasses suppliers of services such as transportation, warehousing, distribution and financial services (Coyle et al. 2013:489). Some of the most prominent disruptions faced by organisations all over the world are expounded upon in the following section.

Supply chain disruptions

The most widely cited definition for supply chain disruptions can be traced to Craighead et al. (2007:132), who observed that: 'A supply chain disruption is an unplanned for and unanticipated event that ends up disrupting the normal flow of goods and materials within the supply chain network'. This definition has been adapted to include non-physical flows such as information and services (Porterfield, Macdonald & Griffis 2012:402), the effects on an organisation's ability to achieve objectives and performance goals (Behdani et al. 2012), and disruptions to the inter-organisational, dyadic relationships between two supply chain members (Bode et al. 2011:833).

Various frameworks and methods have been developed to categorise risks and disruptions, but consensus on the best framework is yet to be researched (Oke & Gopalakrishnan 2009:168; Sheffi 2015:32). These methods include the location-based method, the scale-based method and, more

recently, the lead-time detection method (Kleindorfer & Saad 2005:60; Sheffi 2015:32; Sodhi & Lee 2007:1430). The location-based method is based on the premise that disruptions can happen in different locations relative to the organisation, either internal, upstream, downstream or between supply chain networks (Behdani 2013; Christopher & Peck 2004:6; Sodhi & Lee 2007:1430). The location-based method is the most user-friendly, specifically for the classification of disruptions, as the quantification of both disruption probability and the associated impact are not required for the method to be applied. (Behdani 2013; Oke & Gopalakrishnan 2009:168). This method is also the most widely cited when compared to other methods, as shown in Table 1.

TABLE 1: Summary of supply chain disruption categorisation literature.

Risk classification methods	References
Location-based classification	Bogataj and Bogataj (2007:291–301); Christopher and Peck (2004:1–14); Dani and Deep (2010:395–410); Jüttner (2005:120–141); Kumar, Tiwari and Babiceanu (2010:3717–3739); Oehmen et al. (2009:343–361); Olson and Wu (2010:694–706); Thun and Hoenig (2011:242–249); Trkman and McCormack (2009:247–258)
Scale-based classification	Gaonkar and Viswanadham (2007:265–273); Huang, Chou and Chang (2009:2485–2506); Kleindorfer and Saad (2005:53–68); Knemeyer, Zinn and Eroglu (2009:141–153); Ravindran et al. (2010:405–424)
Other methods, including the lead-time detection method	Cavinato (2004:383–387); Chopra and Sodhi (2004:53–61); Kleindorfer and Saad (2005:53–68); Matook, Lasch and Tamaschke (2009:241–267); Peck (2005:210–232); Sheffi (2005:12–15); Tang (2006:451–488); Tang and Musa (2011:25–34); Wu, Blackhurst and Chidambaram (2006:350–365)

Source: Adapted from Behdani, B., 2013, 'Handling disruptions in supply chains: An integrated framework and an agent-based model', PhD thesis, Delft University of Technology, Delft, the Netherlands, p. 56, viewed 22 March 2016, from http://repository.tudelft.nl/view/ir/ uuid:6f5e8db3-c1b7-4b2d-8035-3ae37a617564/

TABLE 2: Types of supply chain disruptions.

Disruption	Source
Intra-organisational	
Production defects	Bowman (2015); Pyke and Tang (2010:243)
Strikes	Barloworld Logistics (2015); Blackhurst et al. (2008:144); Langley (2012); McKinnon (2006:228); Stecke and Kumar (2009:194)
Industrial accidents	Mitroff and Alpaslan (2003:10); Stecke and Kumar (2009:199)
Stock outs	Blackhurst et al. (2005:4068, 2008:143)
Equipment malfunctions	Bowman (2015:32)
IT systems failures	Behdani et al. (2012:12); Faisal, Banwet and Shankar (2007:679); Sutton (2006:100–101)
Inter-organisational	
Customs delays	Blackhurst et al. (2008:144); Porterfield et al. (2012:410); Stecke and Kumar (2009:194)
Transportation breakdowns	Business Continuity Institute (2014); Mitroff and Alpaslan (2003:10); Sheffi (2015:31); Stecke and Kumar (2009:200)
Hijackings	British Standards Institute (2015); Langley (2012)
3PL bankruptcy	Levary (2008:538); Stecke and Kumar (2009:203)
Extra-organisational	
Natural disasters	Blackhurst et al. (2008:144); Klibi, Martel and Guitouni (2010:285); Langley (2012)
Terrorism	Langley (2012); Mitroff and Alpaslan (2003:10); Stecke and Kumar (2009:194)
Political instability	Barloworld Logistics (2015); Bowman (2015)
Currency volatility	Barloworld Logistics (2015); Bowman (2015); Business Continuity Institute (2014)
Government regulations	Business Continuity Institute (2014); Langley (2012); Stecke and Kumar (2009:194)

Source: Adapted from Behdani, B., Adhitya, A., Lukszo, Z. & Srinivasan, R., 2012, 'How to handle disruptions in supply chains: An integrated framework and a review of literature', p. 22, viewed 22 March 2016, from http://0-papers.ssrn.com.innopac.up.ac.za/sol3/ papers.cfm?abstract_id=2114201

It is evident that there are a variety of disruptions that can take place in different locations relative to the organisation (Christopher & Peck 2004). The first type of disruption is intra-organisational, which takes place within the organisation, such as strikes or IT systems failures (Christopher & Peck 2004:4). The second type of disruption is inter-organisational, which is external to the organisation but internal to the supply chain network, and includes customs delays and trucks breaking down (Christopher & Peck 2004:4). The third type of disruption takes place within the extra-organisational environment, or external to the supply chain network of the organisation, and includes natural disasters and terrorism (Christopher & Peck 2004:5). Disruptions affect an organisation's operational abilities, its financial well-being and relationships with stakeholders, and can have varying frequencies of occurrence across countries and regions (Behdani 2013; Hendricks & Singhal 2005a:695, 2005b:37; Porterfield et al. 2012:400).

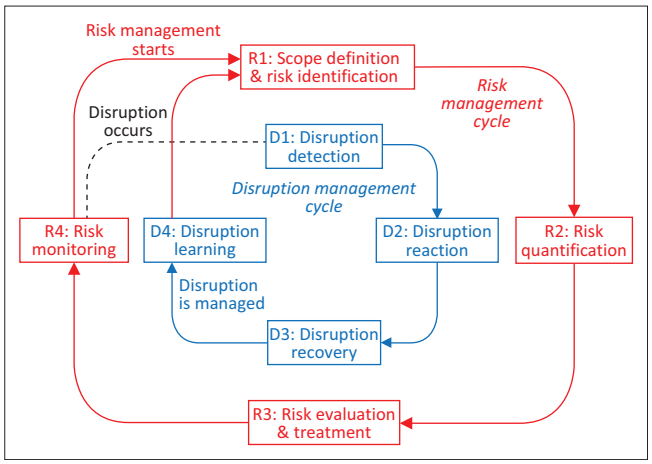
Table 2 lists the most commonly discussed and most commonly identified supply chain disruptions in the literature, according to their location relative to the affected organisation.

It is evident from the literature that organisations experience disruptions throughout the world. Świerczek (2014:90) points out that supply chain disruptions have a 'snowball effect'; therefore, the impact increases as it progresses through the links in the supply chain. It is therefore critical that supply chains identify, react and respond to disruptions in a timely and effective manner to reduce its negative impact as much as possible (Chang, Ellinger & Blackhurst 2015:643). Subsequently, disruption management is reviewed.

Disruption management

Proactive and reactive plans to address disruptions are seen as supply chain risk management and supply chain disruption management, respectively (Dani & Deep 2010:396). Supply chain risk management, which is defined by Jüttner, Peck and Christopher (2003:200) as 'the identification of potential sources of risk and the implementation of appropriate strategies through a coordinated approach among supply chain members to reduce supply chain vulnerability', takes place before disruptions. Supply chain disruption management, defined by Behdani et al. (2012) as 'a structured and continuous process to analyse the impact of disruptions across the supply chain and to handle them in their entire life cycle', occurs after a disruption has occurred.

In general, there is an agreement among scholars that, even though the topic of risk management has been adequately researched and implemented in the field, disruptions still take place (Behdani et al. 2012; Melnyk, Zsidisin & Ragatz 2005:33). It is therefore critical that the focus be shifted from the prevention of disruptions to the response and management there of (Golgeci & Ponomarov 2013:611; Macdonald & Corsi 2013:270).



Source: Adapted from Behdani, B., 2013, 'Handling disruptions in supply chains: An integrated framework and an agent-based model', PhD thesis, Delft University of Technology, Delft, the Netherlands, p. 34, viewed 22 March 2016, from http://repository.tudelft.nl/view/ir/ uuid:6f5e8db3-c1b7-4b2d-8035-3ae37a617564/

FIGURE 1: Integrated framework for managing disruption risks in supply chains.

Grounded in the seminal framework on disruption management by Blackhurst et al. (2005:4069) and the 3R framework by Pyke and Tang (2010:244), the integrated framework for managing disruptions and risks in supply chains (InForMDRiSC) was developed for managing disruption risks (Behdani 2013). To date, this is the most recent and integrated framework that combines perspectives from both risk management and disruption management. Figure 1 is an illustration of the framework and shows how risk and disruption management interlink.

For the purposes of this study, the main focus is on the disruption management cycle, while a brief overview of the risk management cycle is provided. According to Behdani (2013), the risk management cycle begins with the setting of boundaries in terms of the system structure and defining performance indicators that need to be monitored to detect potential disruptions. The second step is to classify potential disruptions according to their degree of impact and likelihood of occurrence. The third step concerns evaluating the risk levels of potential disruptions and treating those with mitigating actions if necessary. Finally, the risk profile of potential disruptions tends to change over time and should be continually monitored for preventative corrective action and to avoid future disruptions.

The disruption management cycle is implemented when the risk management cycle fails to prevent a disruption from occurring. This cycle includes detection, reaction, recovery and learning, each of which is discussed below:

Disruption detection: This is the first action to be taken once a disruption has materialised. The disruption's characteristics and expected consequences are identified. Throughout the literature, great emphasis is placed on the quick detection of disruptions to lower its impact. This enables organisations to identify and resolve potential problems timeously (Sheffi 2015:36).

Disruption reaction: Here it is argued that the organisation must react quickly to disruptions so that the supply chain can return to its normal operations. This effort should start by assembling reaction teams that represent both parties and the various roles within each party (Macdonald & Corsi 2013:272). The ability of organisations and their functions to work together as a team will determine how productively they handle a disruption (Scholten et al. 2014:219). Blackhurst et al. (2005:4072) highlighted that visibility in the supply chain is a vital prerequisite for responding to disruptions and strongly influences the initial recovery process.

Disruption recovery: If the initial reaction plans were inadequate and too weak to resolve a disruption, or when there was no plan whatsoever, alternative solutions should be implemented immediately. When a disruption strikes, it is too late for preventative measures, and collaborative action with other supply chain members becomes crucial in resolving the disruption (Scholten et al. 2014:222).

Disruption learning: After a disruption has been successfully dealt with, the organisation should review the process and take note of important lessons learnt, in preparation for potential future disruptions (Behdani 2013). Supply chain managers should formulate written policies, plans and procedures to enable the organisation to be better equipped when the next disruption is discovered (Bowman 2015).

It is reported that approximately 40% of organisations globally have detailed plans for dealing with disruptions (Asgary & Naini 2011:97; Black & Ray 2011; Kamalahmadi & Parast 2016:116; PWC 2016:21). Oke and Gopalakrishnan (2009:173) also commented on an unstructured ad hoc method to manage supply chain disruptions. It is unknown whether South African organisations base their responses on a disruption management framework or another structured approach, or deal with it on an unstructured ad hoc basis. Therefore, the authors explore in this study how South African 3PLs and their clients manage disruptions when they do occur.

Methodology

Research design

This study adopted a qualitative, exploratory research design. Primary data were gathered using a generic qualitative approach. This provided the necessary flexibility to explore and add knowledge to the current field of supply chain disruptions in an effort to diminish gaps in the existing literature (Cooper & Endacott 2007:817; Davis & Mentzer 2006:55). This approach helped the researchers gather multiple perspectives from participants to gain a full picture of the topic under investigation (Creswell 2012:185–186).

Sampling

The units of analysis for this study were 3PLs and their clients based in South Africa, in the context of supply chain disruptions. To investigate how 3PLs and clients deal with disruptions, the researchers interviewed participants at 11 3PLs and participants at 11 client organisations key to the 3PL business.

Critical incident criterion sampling was used, as there should have been a recent major disruption between the two organisations involved (Patton 2015:281). Additionally, both organisations should have satisfied the definition of a buyer and supplier of logistic services and should have an office in South Africa. The authors contacted organisations within their existing network, whereas other 3PLs or client organisations were identified using general Internet searches. Once a 3PL or a client firm agreed to participate in this study, snowball sampling was used to identify the other organisation with which they experienced a disruption. The individual from the first organisation was identified using criterion sampling, as they should have been directly involved in the management of the disruption and should have had decision-making authority. Snowball sampling was once again used to identify the individual from the other organisation that fulfilled the same criteria. The reason for the authors focusing on two organisations that jointly had a major disruption was to ensure that a 3PL and client are involved in the same supply chain to provide insights on the same disruption but from different perspectives.

The scope and exploratory nature of this study influenced the information required and therefore warranted a larger sample size than the typical qualitative study (Creswell 2012:209; Merriam 2009:80). After three consecutive disruption scenarios did not deliver significantly new data, saturation was reached at 22 interviews (Francis et al. 2010:1241).

Overall, the study consisted of 24 participants and 22 interviews. (In two of the interviews, the organisations provided two employees to participate, in the interests of a more holistic view on supply chain disruptions in their respective organisations.) Figure 2 presents a summary of participants.

Data collection

Semi-structured interviews were conducted over a period of two months. The interviews for the study comprised 16 face-to-face interviews, two video calls and four telephonic interviews. The latter two methods were used because of geographic constraints. Semi-structured interviews were used, as flexibility and adaptability were required because of insufficient knowledge on the topic. The aim was a deeper understanding of disruptions faced by 3PLs and clients based in South Africa (Rowley 2012:262). Most participants were interviewed in private at their organisation's offices, with one participant being interviewed at a coffee shop. The discussion guide was centred on the study's research questions, asking open-ended questions to explore information about each research question. The discussion guide underwent a pretest with a single participant. As only minor amendments were necessary after the pretest, data collection could continue. All of the interviews were audio-recorded and transcribed. The researchers transcribed 18 interviews, while 4 were transcribed by a transcription service provider because of capacity constraints. The researchers listened to each recording to ensure verbatim transcripts. The average length of the interviews was 39 min.

Data analysis

Thematic analysis was used to analyse the data. The researchers systematically identified codes, organised them into similar groups and finally gained insight into the patterns of meaning, otherwise known as themes, within the

Buyer code	Job title	Years in industry	Buyer org code	Industry	Supply chain disruption	Supplier code	Job title	Years in industry	Supplier org code	Industry
B1	Supply chain executive	17	BC1	FMCG		**S1**	Supply chain manager	20	SC1	3PL
B2	Transport services manager	5	BC2	Retail		**S2**	Strategic client lead	10	SC2	3PL
B3	Logistics representative	4	BC3	Agriculture		**S3**	Operations manager	6	SC3	3PL
B4	CEO	15	BC4	Wholesale		**S4**	Managing director	15	SC4	3PL
B5	National logistics manager	7	BC5	FMCG		**S5**	Contract manager	24	SC5	3PL
B6A	Logistics administrative manager	3	BC6	Retail		**S6**	Sales director	25	SC6	3PL
B6B	Managing director	30								
B7	Dealer services manager	6	BC7	Mining and heavy commercial		**S7**	Transport manager	17	SC7	3PL
B8	Imports manager	20	BC8	Retail		**S8**	Senior director	20		
B9	Distribution manager	9	BC9	Retail		**S9**	Operations director	18	SC9	3PL
B10A	Strategic sourcing manager	5				**S10**	Divisional executive	2	SC10	3PL
B10B	Group shipping manager	4								
DID NOT PARTICIPATE						**S11**	Branch manager	5	SC11	3PL
B12	Supply chain manager	3	BC12	Chemical		DID NOT PARTICIPATE				

Total number of participants: 24. Average length: 39 min.
Total number of interviews: 22. Gender: 18 male, 6 female.
Total number of direct relational links: 10.

CEO, chief executive officer; FMCG, fast-moving consumer goods.

FIGURE 2: Participants' details.

data set (Braun & Clarke 2012:57). Codes are used to summarise what participants said or the researcher's interpretation thereof (Creswell 2012:243–245). All interview transcriptions were individually coded and re-coded by both researchers to ensure similar codes were identified and formed from the data. This subsequently increased the study's trustworthiness by avoiding any potential biased perspective of one researcher. Once completed, all the codes were added to a master list. This helped group them into sub-themes which then lead the researchers to the main themes. Each code identified has supporting raw data extract and is categorised under a sub-theme and main theme.

Trustworthiness

The researchers practised several techniques, previously proposed as best practice, to ensure the trustworthiness of the research. Researcher triangulation was used, whereby the researchers were both present during interviews and worked closely together during the thematic analysis. Investigator triangulation took place, as both 3PLs and their respective clients involved in the management of a specific disruption were interviewed. Peer-debriefing was conducted with seasoned academics who had extensive experience in research methods. A detailed audit trail was kept in terms of the methodology and thematic analysis of this study.

Ethical considerations

This study was approved by the research ethics committee of a South African university prior to data collection. All participants gave voluntary consent to be interviewed and signed an informed consent form. The researchers assured the participants before the start of each interview that anonymity and confidentiality would be practiced. The researchers also reminded the participants that they could change their minds at any time.

Findings

The following section describes the study's findings in relation to the research questions. Evidence is provided using raw data extracts and links to existing literature. After comparing qualitative themes and codes, no meaningful differences were found between the disruptions experienced by 3PLs and clients, respectively. Therefore, the discussion that follows will not compare the views of 3PLs and clients, but rather provide a combined screenshot of reality.

Supply chain disruptions

The first research question was related to the types of disruptions South African 3PLs and their clients face. As participants were asked to comment only on major disruptions, it should be noted beforehand how the participating organisations categorise the severity of the disruptions they face, which emerged as a topic during data analysis. Many participants mentioned more than one way to establish disruption severity. Sixteen participants indicated that they measure the severity of disruptions based on time delays or the amount of time that their organisation falls behind schedule because of the disruption. Time delays include delays in deliveries, which can dissatisfy customers. Sixteen participants indicated that they measure this as a loss in monetary value because of the disruption, as far as they are able to quantify the losses and opportunity costs incurred. The participants specifically mentioned that the financial impact of supply chain disruptions is difficult to quantify and is in most instances merely an estimate.

Ten participants mentioned that they use key performance indicators (KPIs) as metrics to measure overall performance. These organisations try to function as normally as possible during a supply chain disruption. Eight participants said that the impact on their direct client is of concern when determining the severity of supply chain disruptions, whereas only four participants mentioned that they focus on the impact of disruptions on the end user in the supply chain. This is concerning, as the definition of a supply chain clearly includes the end user as the main focus of delivery (APICS 2013:171).

The disruptions that South African 3PLs and their clients face have been summarised in Figure 3 to show the number of participants that identified each type of disruption. The findings have been grouped according to identified themes and sub-themes. The themes of disruptions are categorised according to the location-based method, as used by Behdani et al. (2012).

Figure 3 shows the different disruptions experienced in each location, relative to the organisation and the number of participants that mentioned the specific disruption.

Intra-organisational disruptions

Intra-organisational disruptions occur internally to the organisation (Christopher & Peck 2004:4). In South Africa, the most prominent disruption according to the respondents is *labour issues*. People working for organisations can disrupt supply chains in several ways. Firstly, labour strikes are a common form of disruption. Secondly, people can make several manual labour errors, such as incorrect system inputs and getting orders wrong. Thirdly, employee turnover is problematic as it disrupts continuity in client service. Lastly, absenteeism disrupts organisations as the individual's tasks must be carried out, without prior notice, by someone with a full workload. Each of these types of disruption can be seen in the following quotes:

> 'Strikes is a big disruption'. (P4, female, Transport manager – Africa)

> 'So what happens is yet again more manual work more issues longer, its taking longer'. (C1, male, Distribution manager)

> 'People come and go, there is no, there is no skill … so if they don't have the skill, it disrupts your ability to continue and to deliver decent service'. (P10, male, Sales director)

Theme	Sub-theme	Participants																				
		B1	B2	B3	B4	B5	B6	B7	B8	B9	B 10	B 12	S1	S2	S3	S4	S5	S6	S7	S8	S9	S 10	S 11
Intra-organisational	Labour issues	1	1	-	-	1	1	1	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1
	Systems and processes	1	-	-	-	1	1	-	1	1	1	1	1	1	-	-	1	1	1	1	-	1	1
	Organisational changes	1	-	-	-	1	-	-	-	1	-	-	-	-	1	1	-	-	-	-	-	-	-
Inter-organisational	Borders	1	1	-	1	1	1	-	1	1	1	1	-	1	-	1	1		1	1	1	1	1
	Service providers	1	1	1	1	1	1	1	-	-	-	-	-	1	1	1	1	1	1	1	1	-	-
	Crime	-	1	-	1	-	1		1	-	1	-	1	1	1		1	-	-	-	1	1	1
	Transportation breakdowns	1	-	-	1	-	1	1	-	-	-	-	1	1	1	1	-	-	-	1	-	1	1
	Corruption	-	-	-	1	-	-	-	1	-	1	1	1	-	1	1	-	-	-	-	1	-	-
Extra-organisational	Natural disasters	-	-	1	1	1	1		-	-	-	1	1	1	-	-	1	1	-	1	1	-	-
	Government regulations	-	-	-	-	1	1	1	-	1	1	1	-	1	-	-	-	1	-	1	1	1	-
	Infrastructure	-	-	-	1	-	-	-	-	1	-	-	1	-	1	1	-	1	-		1	-	1
	Political instability	-	-	-	-	1	-	-	-	1	-	1		1	1		-	-	-	-	1	1	-
	Terrorism	-	-	-	1	-	-	1	-	-	-	-		-	-	1	-	1	-	-	1	-	-
	Currency volatility	-	-	1	-	1	-		-	-	-	-	1	-	-		-	-	-	-	1	-	-

FIGURE 3: Frequencies of disruptions for South African 3PLs and their clients.

> 'Guys not pitching up to work … So that's one major, if you can't finish your orders, [the] client is not going to be very happy. If he is not happy then it can be a disruption'. (P8, male, Operations manager)

Strikes have been mentioned multiple times as a supply chain disruption; therefore this study supports the findings of previous research (Barloworld Logistics 2015; Blackhurst et al. 2008:144; Langley 2012; McKinnon 2006:228). Employee issues such as manual labour errors, employee turnover and absenteeism have been mentioned as a point of possible vulnerability in the supply chain - (Sarathy 2006:32). Therefore, this finding supports previous academic research.

Systems and processes are also often seen as a major disruption. This sub-theme includes information systems downtime, system integration problems and a lack of data integrity. Several participants commented that organisational processes served as a barrier to the normal flow of goods and services and therefore disrupted and limited the ability of their supply chain, as can be seen in the following quotes:

> 'So that's where our first thing came in, that there was an integration issue. That the two systems didn't speak to each other, which was obviously a major disruption for us'. (C1, male, Distribution manager)

> '… Internal reasons for disruptions, so if there was a process failure or a systems failure'. (P5, male, Divisional executive)

> 'For example a customer may be governed by international standards so the head office is overseas and because of the IT system they only have the released stock at certain warehouses … so you know that's a major disruption'. (P12, male, Branch manager)

IT systems downtime and the temporary failure of systems have been previously mentioned in the literature (Faisal et al. 2007:679; Sutton 2006:100–101). Therefore, this study's findings support the current literature in terms of IT system failure as a supply chain disruption. Rigid processes add to disruptions when organisational policies on how things should be done limit the flexibility and power of organisations in reacting during supply chain disruptions.

Organisational changes, such as acquisitions and strategic changes, disrupt 3PLs and their clients based in South Africa, because they change what is accepted as the 'normal' way of doing business, which ultimately disrupts supply chains. The effect of acquisitions was commented on as follows:

> 'And the other big thing in the CF9 world was also we were taken over … by Company 1 and that brought about a lot of operational delays and create and a person would think that an acquisition shouldn't have an impact on the operational side of the business but it did'. (C9, female, Imports manager)

Porterfield et al. (2012:410) mentioned that 3PL transition is a disruption that should be better managed. Christopher (2016:215) also noted that strategic changes in an organisation can disrupt the supply chain. Therefore, this finding supports these sources of literature.

Inter-organisational disruptions

Third-party logistics and client organisations based in South Africa face significant inter-organisational disruptions, which are 'external to the organisation but internal to the supply chain network' (Christopher & Peck 2004:4). The biggest disruption in this area is problems experienced while crossing *borders*. This includes delays at ports, blank sailing and delays to clear customs at both harbours and inland border posts:

> 'It's when they have blank sailings cause there's not enough cargo to force and then they don't call ports for a couple of weeks and then you have to add 2 weeks to a lead time. … customs, that's probably our biggest disruptions I would say'. (C5A, female, Strategic sourcing manager)

The delays at physical border posts are especially experienced moving into Africa, as seen in the words of P4:

> 'In the business environment and moving cargo into Africa, there is many disruptions, we have the border delays ...' (P4, female, Transport manager – Africa)

Supply chain disruptions at borders, ports and while dealing with customs are not new to the supply chain literature (Porterfield et al. 2012:410); therefore, this study supports the current body of knowledge.

Supply chains can also be disrupted by *service providers* who form part of the supply chain. Service providers disrupt the supply chain when agreements between the two organisations are not met, when there is a misalignment in priorities, when either the 3PL or client declares bankruptcy, or when organisations change their outsourced service provider or client. The following quote illustrates this:

> 'And then disruptions ... is that we do deal with third party service providers [pause], where we have issues with them or where they haven't kept to their SLA or require extra services where it hasn't occurred'. (C1, male, Distribution manager)

Some researchers have identified 3PL bankruptcy and delays from suppliers as key disruptions in the supply chain (Behdani et al. 2012; Porterfield et al. 2012:410). This indicates that agreements not being met and a misalignment in priorities between 3PLs and their clients are key reasons why organisations' service providers disrupt their supply chains.

Organisations also face disruptions because of *transportation breakdowns*. This sub-theme includes accidents and mechanical failures that cause trucks to stop. An accident can cause a disruption by either damaging the truck or causing traffic blockages that delay transportation further. These two disruptions are supported by the following quotes:

> 'Predominantly the disruptions that we face is usually either mechanically inclined, so where a vehicle breaks down ...'. (P2, male, Managing director)

> 'So there you can have the following: you can either have a breakdown, either mechanical or flat tire; whatever; accident'. (P11, male, Contract manager)

Transportation breakdowns as an inter-organisational supply chain disruption support numerous sources of literature that found the same result (Business Continuity Institute 2014; Mitroff & Alpaslan 2003:10; Sheffi 2015:31).

South African organisations are also continuously disrupted by *crime*, which includes theft and hijacking of assets. Several participants mentioned delivery failures because of goods being stolen. Others mentioned trucks being stolen *en route* to either the client or the final destination, as clarified below:

> 'We obviously have a number of issues with theft, and the actual security of cargo'. (C4, male, Dealer services manager)

> 'Hijacks is a reality in South Africa … there's a lot of hi-jackings there. You know they averaging 1 high-jack a week'. (P1, male, Operations director)

Crime as a supply chain disruption is not found extensively in existing literature. However, the British Standards Institute (2015) and Langley (2012) listed hijacking as disruptive to supply chains. South Africa is a crime-ridden country and the theft of goods is not a surprising supply chain disruption for organisations that operate in high-risk areas, especially those carrying high-value goods.

Corruption remains a great challenge to operations in Southern Africa, and P1 commented as follows:

> 'There's so much corruption and fraud outside'. (P1, male, Operations director)

Corruption has not previously been found in the literature to be something that directly disrupts supply chains; therefore, this finding adds to the current body of knowledge. Corruption is common and widespread in the whole of Africa. This impedes on the seamless flow of goods between organisations and countries, especially for organisations that insist on doing ethical business (Huffington Post 2017). The general high rates of corruption in Southern Africa also increase the landed cost of products, further impeding the general welfare of business in South Africa.

Extra-organisational disruptions

Disruptions can be experienced 'external to the supply chain network' (Christopher & Peck 2004:5). These are the disruptions over which the organisation has the least control in terms of occurrence and prevention. The first extra-organisational disruption is *natural disasters*, which comprise *force majeure* (acts of God, or beyond man's control) and bad weather. The following quotes illustrate this:

> 'The drought ... has made a huge impact in terms of our raw material costs'. (C3, male, Supply chain executive)

> 'We've had natural disasters. We've had cyclones and hurricanes, typhoons'. (C5, female, Strategic sourcing manager)

Natural disasters are not unfamiliar to research on supply chain disruptions, and the findings of this study corroborate the findings of several authors (Blackhurst et al. 2008:144; Klibi et al. 2010:285; Langley 2012).

Government regulations pose one of the biggest external disruptions. Government regulations differ substantially because of differences in industry, product and distribution area. This affects several supply chains when they have to comply with new, and sometimes unforeseen, regulations, as seen in the following quote:

> 'But we need to comply to the legislation, that's our number 1 imperative is to comply to the legislation'. (P7, female, Strategic client lead)

Government regulations, and changes therein, have been known to cause disruptions in supply chains; therefore, this finding supports existing literature (Business Continuity Institute 2014; Langley 2012).

The *lack of infrastructure* is evident in Southern Africa, especially physical infrastructure such as roads and bridges. Therefore, supply chains are disrupted when, for example, a truck cannot continue its journey into rural areas because the roads are bad or bridges no longer exist. As seen in the following quotes:

> 'So, your big disruption is infrastructure. And lack of infrastructure development in South Africa'. (P10, male, Sales director)

> 'So you end up with trucks being held up for kilometres because there's no way to get across the river'. (C4, male, Dealer services manager)

Even though IT and energy infrastructure have been cited as possible disruptions to supply chains by Langley (2012) and Blackhurst et al. (2008:144), no scholarly work in the literature was found that identified physical public infrastructure such as the lack of roads, non-existent bridges and other challenges as supply chain disruptions. Therefore, this finding expands the existing literature on supply chain disruptions.

Terrorism is experienced more frequently in areas with extensive rebel activity where 3PLs based in South Africa often operate; yet, it still remains a disruption that is impossible to predict. The following quote illustrates this:

> 'We've had bomb threats at stores, which means we can't deliver because they have a complete lockdown'. (C7, female, Transportation services manager)

Terrorist activities disrupt the supply chain, as it is often unexpected and can have a devastating impact if executed. Terrorism is also not new to the world, or to 3PLs and client organisations based in South Africa; therefore, this finding supports the findings of previous studies (Langley 2012; Mitroff & Alpaslan 2003:10; Stecke & Kumar 2009:194).

Other disruptions mentioned repeatedly are *political instability* and *currency volatility*, particularly macro- and microeconomic effects, which disrupt supply chains in Africa:

> 'We all can see what is happening to the economy, we all a bit maybe uncertain about the political climate in the country now you know what if everything goes south in 6 months' time'. (C9, female, Imports manager)

The degree of volatility and instability varies significantly between countries and industries, and the South African economic and political environments have been volatile in the past. It is, however, clear that several authors have previously identified both political instability and currency volatility as supply chain disruptions (Barloworld Logisitcs 2015:15; Behdani et al. 2012).

Overall, disruptions identified in the external environment are not often mentioned by participants, and those that are mentioned are similar to those summarised by Behdani et al. (2012). This could indicate that external disruptions are universal to some extent and not the biggest threat to organisations. From the frequency of disruptions mentioned, the researchers can conclude that the majority of 3PLs and their clients based in South Africa face some of their biggest, most frequent disruptions from within their own organisations.

The evidence of disruption frequency is clear; therefore, the focus shifts to the management of these disruptions.

Disruption management procedures

Disruption management techniques can range from a structured approach, as seen in the InForMDRiSC Framework by Behdani (2013), or a more ad hoc approach where judgement is used in every situation, as mentioned by Oke and Gopalakrishnan (2009:173). The participants provided insight into whether they use disruption management procedures and manage disruptions on an ad hoc basis, or if they only learn from disruption management efforts to be better prepared for future disruptions and the management thereof. Participants sometimes mentioned that they have specific disruption management procedures for certain disruptions and manage others on an ad hoc basis, placing them in both spheres. In terms of disruption management procedures and the steps they follow, 11 participants indicated that they use specific procedures for specific, reoccurring disruptions, whereas 9 participants indicated that they have vague outlines for disruptions that occur less frequently. The specific steps for certain disruptions are evident from the following quote:

> 'So let's take a good example if we've got a[n] ammonia leak on site, there's an emergency procedure on site that will happen according to guidelines. If there's a hi-jacking, according to guidelines. So we've got all the written procedures written down and explaining what to do'. (P11, male, Contract manager)

Six of the participants stated that they do not use disruption management procedures at all, but rather deal with disruptions as they occur, sometimes cumulating into a confused scramble to bring everything under control. This is evident in the following quote:

> 'So how do we deal with it. Well when it does hit us, its kneejerk. You deal with it at the moment'. (P10, male, Sales director)

This resembles the findings by Oke and Gopalakrishnan (2009:173), in that disruption management can be generic and can therefore be applied to several different types of disruptions.

From this, it is evident that most South African 3PLs and their clients do make use of structured disruption management processes, on par with suggestions by Behdani (2013).

However, 17 participants noted that they do have an element of learning whenever a disruption is resolved, to be better prepared for it the next time, as the following quote highlights:

> 'I mean with every new disruption you learn what you didn't learn last time cuz one factor can change so it is continuous learning and continuous adjusting'. (P12, male, Branch manager)

Ten participants mentioned the use of risk management strategies, otherwise known as disruption prevention. The findings show that South African 3PLs and their clients prefer learning over traditional risk management as a method to handle future disruptions. As learning is a step in the disruption management cycle, this evidence supports several other authors in their argument that the focus of organisations has shifted from risk management to disruption management (Golgeci & Ponomarov 2013:611; Macdonald & Corsi 2013:270).

Discussion

Summary and theoretical implications

The purpose of this study was to explore supply chain disruptions in a South African 3PL and client context. With this study, the researchers aimed to answer two research objectives, namely (1) exploring which specific disruptions 3PLs and their clients based in South Africa face, and (2) how these organisations manage the disruptions. Because the participants were only asked to comment on major disruptions, the researchers also investigated the ways in which organisations determine the severity of supply chain disruptions. Several participants mentioned time delays, monetary losses, KPI performance and direct client impact. Only four participants mentioned that they focus on the end user in the supply chain. As supply chains should focus on delivering value to the end customer, this is of some concern. The supply chain will be much more aligned if members focus on the end user, specifically during times of disruption.

In terms of the disruptions that South African 3PLs and their clients face, labour issues were found to be a major source of disruptions internal to the organisation. Other disruptions that occur in the intra-organisational environment include systems and processes, strikes and organisational changes. The most prominent factors, which support the existing literature on supply chain disruptions, were labour issues and organisational processes. In the inter-organisational environment, borders was the most frequently mentioned disruption. This was accompanied by service providers, transportation breakdowns, crime and corruption. Disruptions that were notably different from the literature, possibly because of geographic context, were crime and corruption, which disrupt supply chains in South Africa on a regular basis. Extra-organisationally, the most prominent disruptions were natural disasters, government regulations, infrastructure, terrorism, political instability and currency volatility. The most notable finding in this regard was how a lack of physical infrastructure, such as roads and bridges, disrupts supply chains in South Africa.

Overall, extra-organisational disruptions seem to be mentioned the least. Most supply chain disruptions take place either within the organisation or within the supply chain network. This could be because most risk management efforts are focussed on external disruptions, thereby making organisations better prepared for these, or because of external disruptions happening less frequently. This finding suggests that organisations should focus within their own organisation or on their direct partners to reduce the effects of supply chain disruptions.

In terms of disruption management, most participants mentioned that they do make use of disruption management procedures, but that these management procedures differ in their specificity. Only a few participants mentioned that they deal with disruptions as they occur and thus improvise to gain control of the situation. This shows that some 3PLs and their clients based in South Africa use structured approaches to manage disruptions, which is on par with best practice from elsewhere in the world. Furthermore, the researchers noted that 3PLs and their clients based in South Africa prefer learning over risk management as a method of dealing with future disruptions. As learning is a step in the disruption management cycle, it is evident that South African organisations are gradually shifting their attention from risk management to disruption management, which is on par with global trends.

Managerial implications

For practitioners, this study serves multiple purposes. Firstly, practitioners can gain insight into what disruptions they can expect to encounter, enabling them to identify, prevent and resolve potential disruptions more effectively. Managers should also aim to shift their focus from external to internal disruptions to manage the most disruptive problem areas first. Furthermore, managers will also be able to prioritise the development of disruption management processes for disruptions that occur repeatedly. Managers should aim to align the entire supply chain to keep focussing on delivering value to end clients, especially during times of disruption. This can be done by altering performance metrics to focus on end client service delivery upstream in the supply chain. In summary, the findings of this study enable managers to manage disruptions in a more effective way by focussing on the things that matter most.

Limitations and directions for future research

Future research could investigate the frequency of the disruptions identified in this study quantitatively, to test whether or not the majority of supply chain disruptions originate intra- or inter-organisationally. This study was limited in scope and only investigated 3PLs and their clients based in South Africa. An investigation into other industries and organisations where 3PL services are not utilised will determine whether the findings in this study are transferable, especially within the geographic context, namely South Africa. This study can also be replicated in other parts of Africa, such as West Africa and East Africa, to further determine the transferability of the findings. The results of the various geographic locations can then be compared to see the differences in supply chain disruptions. This could be beneficial to multinationals who operate across Africa, as they will be able to focus managerial efforts as needed in each area. This study only provided a broad overview of how

3PLs and their clients based in South Africa manage supply chain disruptions, whereas future research could provide an in-depth analysis of disruption management and aim to identify best practice in this context.

Acknowledgements

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

This article is based on the honours dissertation of E.D.G. and J.N. and they were therefore the main researchers. W.N. assisted as supervisor with the conceptualisation, literature review, methodology, data analysis and preparation of the article.

References

Agigi, A., Niemann, W. & Kotzé, T., 2016, 'Supply chain design approaches for supply chain resilience: A qualitative study of South African fast-moving consumer goods grocery manufacturers', *Journal of Transport and Supply Chain Management* 10(1), 1–15. https://doi.org/10.4102/jtscm.v10i1.253

Analytiqa, 2013, *Africa logistics: Keep cool for growth*, viewed 06 June 2016, from http://www.joc.com/sites/default/files/ u52092/Arica.pdfa

APICS, 2013, *APICS dictionary: The essential supply chain reference*, 14th edn., APICS, Chicago, IL.

Asgary, A. & Naini A., 2011, 'Modeling the adaption of business continuity planning by businesses using neural networks', *Intelligent Systems in Accounting, Finance & Management* 18(2/3), 89–104. https://doi.org/10.1002/isaf.326

Barloworld Logistics, 2015, *Supply chain foresight*, viewed 06 June 2016, from http://www.barloworld-logistics.com/wp-content/uploads/2013/11/supplychainforesight-2015-report.pdf

Behdani, B., 2013, 'Handling disruptions in supply chains: An integrated framework and an agent-based model', PhD thesis, Delft University of Technology, Delft, the Netherlands, viewed 22 March 2016, from http://repository.tudelft.nl/view/ir/uuid:6f5e8db3-c1b7-4b2d-8035-3ae37a617564/

Behdani, B., Adhitya, A., Lukszo, Z. & Srinivasan, R., 2012, 'How to handle disruptions in supply chains: An integrated framework and a review of literature', viewed 22 March 2016, from http://0-papers.ssrn.com.innopac.up.ac.za/sol3/papers.cfm?abstract_id=2114201

Black, T. & Ray, S., 2011, 'The downside of just-in-time inventory', in *Business Week 14 March*, viewed 18 April 2016, from https://www.bloomberg.com/news/articles/2011-03-24/the-downside-of-just-in-time-inventory

Blackhurst, J., Craighead, C.W., Elkins, D. & Handfield, R.B., 2005, 'An empirically derived agenda of critical research issues for managing supply-chain disruptions', *International Journal of Production Research* 43(19), 4067–4081. https://doi.org/10.1080/00207540500151549

Blackhurst, J.V., Scheibe, K.P. & Johnson, D.J., 2008, 'Supplier risk assessment and monitoring for the automotive industry', *International Journal of Physical Distribution & Logistics Management* 38(2), 143–165. https://doi.org/10.1108/09600030810861215

Bode, C., Wagner, S.M., Petersen, K.J. & Ellram, L.M., 2011, 'Understanding responses to supply chain disruptions: Insights from information processing and resource dependence perspectives', *Academy of Management Journal* 54(4), 833–856. https://doi.org/10.5465/AMJ.2011.64870145

Bogataj, D. & Bogataj, M., 2007, 'Measuring the supply chain risk and vulnerability in frequency space', *International Journal of Production Economics* 108(1–2), 291–301. https://doi.org/10.1016/j.ijpe.2006.12.017

Botes, A., Niemann, W. & Kotzé, T., 2017, 'Buyer-supplier collaboration and supply chain resilience: A case study in the petrochemical industry', *South African Journal of Industrial Engineering* 28(4), 183–199. http://doi.org/10.7166/28-4-1736

Bowman, J., 2015, 'Strategies for mitigating supply chain disruptions', PhD thesis, Walden University, Minneapolis, MN, viewed 19 March 2016, from http://0-scholarworks.waldenu.edu.innopac.up.ac.za/dissertations/1836/

Braun, V. & Clarke, V., 2012, 'Thematic analysis', in H. Cooper (ed.), *APA handbook of research methods in psychology: Volume 2: Research designs*, pp. 57–71, American Psychological Association, Washington, DC.

British Standards Institute, 2015, *SCREEN global intelligence report*, British Standards Institute, viewed 13 April 2016, from https://www.securecargo.org/sites/securecargo.org/files/bsi-2015-screen-global-intelligence-report.pdf

Business Continuity Institute, 2014, *Supply chain resilience 2014*, viewed 23 July 2016, from http://www.bcifiles.com/supply-chain.pdf

Cavinato, L.J., 2004, 'Supply chain logistics risks: From the back room to the board room', *International Journal of Physical Distribution and Logistics Management* 34(5), 383–387. https://doi.org/10.1108/09600030410545427

Cerris, 2016, *Supply chain trends: 7 of 12 trends that will drive supply chain management in 2016*, viewed 01 April 2016, from http://cerasis.com/2016/01/04/2016-supply-chain-trends/

Chang, W., Ellinger, A.E. & Blackhurst, J., 2015, 'A contextual approach to supply chain risk mitigation', *The International Journal of Logistics Management* 26(3), 642–656. https://doi.org/10.1108/IJLM-02-2014-0026

Chopra, S. & Sodhi, M.S., 2004, 'Managing risk to avoid supply-chain breakdown', *Sloan Management Review* 46(1), 53–61.

Christopher, M., 2016, *Logistics and supply chain management*, 5th edn., Pearson, Dorset, UK.

Christopher, M. & Peck H., 2004, 'Building the resilient supply chain', *The International Journal of Logistics Management* 15(2), 1–14. https://doi.org/10.1108/09574090410700275

Cooper, S. & Endacott, R., 2007, 'Generic qualitative research: A design for qualitative research in emergency care?', *Emergency Medicine Journal* 24(12), 816–819. https://doi.org/10.1136/emj.2007.050641

Coyle, J.J., Langley C.J., Novack, R.A. & Gibson, B.J., 2013, *Supply chain management: A logistics perspective*, 10th edn., Cengage Learning, Boston, MA.

Craighead, C.W., Blackhurst, J., Rungtusanatham, M.J. & Handfield, R.B., 2007, 'The severity of supply chain disruptions: Design characteristics and mitigation capabilities', *Decision Sciences* 38(1), 131–156. https://doi.org/10.1111/j.1540-5915.2007.00151.x

Creswell, J.W., 2012, *Education research: Planning, conducting and evaluating quantitative and qualitative research*, 4th edn., Pearson, Boston, MA.

Dani, S. & Deep, A., 2010, 'Fragile food supply chains reacting to risks', *International Journal of Logistics Research and Applications* 13(5), 395–410. https://doi.org/10.1080/13675567.2010.518564

Davis, B.R. & Mentzer, J.T., 2006, 'Logistics service driven loyalty: An exploratory study', *Journal of Business Logistics* 27(2), 53–73. https://doi.org/10.1002/j.2158-1592.2006.tb00217.x

Faisal, M., Banwet, D.K. & Shankar, R., 2007, 'Information risks management in supply chains: An assessment and mitigation framework', *Journal of Enterprise Information Management* 20(6), 677–699. https://doi.org/10.1108/17410390710830727

Foulds, S., 2013, 'Transportation management outsourcing', *Transport World Africa* 11(5), 32–34.

Francis, J.J., Johnston, M., Robertson, C., Glidewell, L., Entwistle, V., Eccles, M.P. et al., 2010, 'What is an adequate sample size? Operationalising data saturation for theory-based interview studies', *Psychology and Health* 25(10), 1229–1245. https://doi.org/10.1080/08870440903194015

Gaonkar, R.S. & Viswanadham, N., 2007, 'Analytical framework for the management of risk in supply chains', *IEEE Transactions on Automation Science and Engineering* 4(2), 265–273. https://doi.org/10.1109/TASE.2006.880540

Golgeci, I. & Ponomarov, S.Y., 2013, 'Does firm innovativeness enable effective responses to supply chain disruptions? An empirical study', *Supply Chain Management: An International Journal* 18(6), 604–617. https://doi.org/10.1108/SCM-10-2012-0331

Havenga, J.H., Simpson, Z.P., King, D., de Bod, A. & Braun, M., 2016, *Logistics Barometer South Africa 2016*, Stellenbosch University, pp. 1–14, viewed n.d. from https://www.sun.ac.za/english/faculty/economy/logistics/Documents/Logistics%20Barometer/Logistics%20Barometer%202016%20Report.pdf

Hendricks, K.B. & Singhal, V.R., 2005a, 'Association between supply chain glitches and operating performance', *Management Science* 51(5), 695–711. https://doi.org/10.1287/mnsc.1040.0353

Hendricks, K.B. & Singhal, V.R., 2005b, 'An empirical analysis of the effect of supply chain disruptions on long-run stock price performance and equity risk of the firm', *Production and Operations Management* 14(1), 35–52. https://doi.org/10.1111/j.1937-5956.2005.tb00008.x

Huang, H.Y., Chou, Y.C. & Chang, S., 2009, 'A dynamic system model for proactive control of dynamic events in full-load states of manufacturing chains', *International Journal of Production Research* 47(9), 2485–2506. https://doi.org/10.1080/00207540701484913

Huffington Post, 2017, *How corruption and political instability have thrown SA into a recession*, viewed 06 June 2017, from http://www.huffingtonpost.co.za/2017/06/06/how-corruption-and-political-instability-have-thrown-sa-into-a-r_a_22128790/

Johnson, M.E., 2001, 'Learning from toys: Lessons in managing supply chain risk from the toy industry', *California Management Review* 43(3), 106–124. https://doi.org/10.2307/41166091

Jüttner, U., 2005, 'Supply chain risk management: Understanding the business requirements from a practitioner perspective', *The International Journal of Logistics Management* 16(1), 120–141. https://doi.org/10.1108/09574090510617385

Jüttner, U., Peck, H. & Christopher, M., 2003, 'Supply chain risk management: Outlining an agenda for future research', *International Journal of Logistics: Research and Applications* 6(4), 197–210. https://doi.org/10.1080/1367556031000162716

Kamalahmadi, M. & Parast, M.M., 2016, 'A review of the literature on the principles of enterprise and supply chain resilience: Major findings and directions for future research', *International Journal of Production Economics* 171, 116–133. https://doi.org/10.1016/j.ijpe.2015.10.023

Kleindorfer, P. & Saad, G.H., 2005, 'Managing disruption risks in supply chains', *Production and Operations Management* 14(1), 53–68. https://doi.org/10.1111/j.1937-5956.2005.tb00009.x

Klibi, W., Martel, A. & Guitouni, A., 2010. 'The design of robust value-creating supply chain networks: A critical review', *European Journal of Operational Research* 203(2), 283–293. https://doi.org/10.1016/j.ejor.2009.06.011

Knemeyer, A.M., Zinn, W. & Eroglu, C., 2009, 'Proactive planning for catastrophic events in supply chains', *Journal of Operations Management* 27(2), 141–153. https://doi.org/10.1016/j.jom.2008.06.002

Kumar, S.K., Tiwari, M.K. & Babiceanu, R.F., 2010, 'Minimisation of supply chain cost with embedded risk using computational intelligence approaches', *International Journal of Production Research* 48(13), 3717–3739. https://doi.org/10.1080/00207540902893425

Langley, C., 2012, *Third-party logistics study: The state of logistics outsourcing*, viewed 02 June 2016, from https://www.capgemini.com/resource-file-access/resource/pdf/2013_Third-Party_Logistics_Study.pdf

Levary, R.R., 2008, 'Using the analytic hierarchy process to rank foreign suppliers based on supply risks', *Computers & Industrial Engineering* 55(2), 535–542. https://doi.org/10.1016/j.cie.2008.01.010

Macdonald, J.R. & Corsi, T.M., 2013, 'Supply chain disruption management: Severe events, recovery, and performance', *Journal of Business Logistics* 34(4), 270–288. https://doi.org/10.1111/jbl.12026

Matook, S., Lasch, R. & Tamaschke, R., 2009, 'Supplier development with benchmarking as part of a comprehensive supplier risk management framework', *International Journal of Operations and Production Management* 29(3), 241–267. https://doi.org/10.1108/01443570910938989

McKinnon, A., 2006, 'Life without trucks: The impact of a temporary disruption of road freight transport on a national economy', *Journal of Business Logistics* 27(2), 227–250. https://doi.org/10.1002/j.2158-1592.2006.tb00224.x

Melnyk, S., Zsidisin, G.A. & Ragatz, G.L., 2005, 'The plan before the storm', *APICS the Performance Advantage* 15(10), 32–35.

Merriam, S.B., 2009, *Qualitative research: A guide to design and implementation*, 2nd edn., Wiley, San Francisco, CA.

Mitroff, I.I. & Alpaslan, M.C., 2003, 'Preparing for evil', *Harvard Business Review* 81(4), 109–115.

Oehmen, J., Ziegenbein, A., Alard, R. & Schonsleben, P., 2009, 'System-oriented supply chain risk management', *Production Planning and Control* 20(4), 343–361. https://doi.org/10.1080/09537280902843789

Oke, A. & Gopalakrishnan, M., 2009, 'Managing disruptions in supply chains: A case study of a retail supply chain', *International Journal of Production Economics* 118(1), 168–174. https://doi.org/10.1016/j.ijpe.2008.08.045

Olson, D.L. & Wu, D.D., 2010, 'A review of enterprise risk management in supply chain', *Kybernetes* 39(5), 694–706. https://doi.org/10.1108/03684921011043198

Patton, M.Q., 2015, *Qualitative research & evaluation methods: Integrating theory and practice*, 4th edn., Sage, Upper Saddle River, NJ.

Peck, H., 2005, 'Drivers of supply chain vulnerability: An integrated framework', *International Journal of Physical Distribution and Logistics Management* 35(4), 210–232. https://doi.org/10.1108/09600030510599904

Porterfield, T.E., Macdonald, J.R. & Griffis, S.E., 2012, 'An exploration of the relational effects of supply chain disruptions', *Transportation Journal* 51(4), 399–427. https://doi.org/10.5325/transportationj.51.4.0399

PWC, 2016, 'Adjusting the lens on economic crime: Preparation brings opportunity back into focus', *Global Economic Crime Survey 2016*, viewed 06 June 2017, from https://www.pwc.com/gx/en/economic-crime-survey/pdf/GlobalEconomicCrimeSurvey2016.pdf

Pyke, D. & Tang, C.S., 2010, 'How to mitigate product safety risks proactively? Process, challenges and opportunities', *International Journal of Logistics: Research and Applications* 13(4), 243–256. https://doi.org/10.1080/13675561003720214

Ravindran, A.R., Bilsel, R.U., Wadhwa, V. & Yang, T., 2010, 'Risk adjusted multicriteria supplier selection models with applications', *International Journal of Production Research* 48(2), 405–424. https://doi.org/10.1080/00207540903174940

Rowley, J., 2012, 'Conducting research interviews', *Management Research Review* 35(3), 260–271. https://doi.org/10.1108/01409171211210154

Sarathy, R., 2006, 'Security and the global supply chain', *Transportation Journal* 45(4), 28–51.

Scholten, K., Sharkey Scott, P. & Fynes, B., 2014, 'Mitigation processes: Antecedents for building supply chain resilience', *Supply Chain Management: An International Journal* 19(2), 211–228. https://doi.org/10.1108/SCM-06-2013-0191

Sheffi, Y., 2005, 'Preparing for the big one', *Manufacturing Engineer* 84(5), 12–15. https://doi.org/10.1049/me:20050503

Sheffi, Y., 2015, 'Preparing for disruptions through early detection', *MIT Sloan Management Review* 57(1), 31–42.

Simba, S., Niemann, W., Kotzé, T. & Agigi, A., 2017, 'Supply chain risk management processes for resilience: A study of South African grocery manufacturers', *Journal of Transport and Supply Chain Management* 11, 1–13.

Sodhi, M. & Lee, S., 2007, 'An analysis of sources of risk in the consumer electronics industry', *Journal of the Operational Research Society* 58(11), 1430–1439. https://doi.org/10.1057/palgrave.jors.2602410

Stecke, K.E. & Kumar, S., 2009, 'Sources of supply chain disruptions, factors that breed vulnerability, and mitigating strategies', *Journal of Marketing Channels* 16(3), 193–226. https://doi.org/10.1080/10466690902932551

Sutton, S.G., 2006, 'Extended-enterprise systems' impact on enterprise risk management', *Journal of Enterprise Information Management* 19(1), 97–114. https://doi.org/10.1108/17410390610636904

Świerczek, A., 2014, 'The impact of supply chain integration on the "snowball effect" in the transmission of disruptions: An empirical evaluation of the model', *International Journal of Production Economics* 157, 89–104. https://doi.org/10.1016/j.ijpe.2013.08.010

Tang, C., 2006, 'Perspectives in supply chain risk management', *International Journal of Production Economics* 132(2), 451–488. https://doi.org/10.1016/j.ijpe.2005.12.006

Tang, O. & Musa, S.N., 2011, 'Identifying risk issues and research advancements in supply chain risk management', *International Journal of Production Economics* 133(1), 25–34. https://doi.org/10.1016/j.ijpe.2010.06.013

Thun, J.H. & Hoenig, D., 2011, 'An empirical analysis of supply chain risk management in the German automotive industry', *International Journal of Production Economics* 131(1), 242–249. https://doi.org/10.1016/j.ijpe.2009.10.010

Trkman, P. & McCormack, K., 2009, 'Supply chain risk in turbulent environments – A conceptual model for managing supply chain network risk', *International Journal of Production Economics* 119(2), 247–258. https://doi.org/10.1016/j.ijpe.2009.03.002

Wagner, S.M. & Bode, C., 2008, 'An empirical examination of supply chain performance along several dimensions of risk', *Journal of Business Logistics* 29(1), 307–325. https://doi.org/10.1002/j.2158-1592.2008.tb00081.x

World Economic Forum, 2016, *The global risks report. Geneva, Switzerland*, viewed 03 October 2016, from http://www3. weforum.org/docs/Media/TheGlobalRisksReport2016.pdf

Wu, T., Blackhurst, J. & Chidambaram, V., 2006, 'A model for inbound supply risk analysis', *Computers in Industry* 57(4), 350–365. https://doi.org/10.1016/j.compind.2005.11.001