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Strategies for Preventing and Mitigating the Effects of Agro-food Supply Chain Disruptions

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Walden University

College of Management and Technology

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Everjoyce Muzvondiwa

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Walden University
2017

Abstract

Strategies for Preventing and Mitigating the Effects of Agro-food Supply Chain
Disruptions

by

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MS, University of London, 1990

BS, University of Zimbabwe, 1986

Doctoral Study Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Business Administration

Walden University

October 2017

Abstract

Supply chain disruptions are detrimental to the performance of companies due to the associated loss of profitability and reduced sustainability. In 2016, organizations lost at least \$1.2 million in a single supply chain disruption. Guided by the contingency theory of fit, the purpose of this exploratory multiple case study was to explore the strategies agribusiness managers use to prevent and mitigate the effects of disruptions in the agro-food supply chains. A total of 5 purposefully-selected agribusiness managers from Harare, Zimbabwe participated in semistructured interviews. Participants were senior agribusiness managers who implemented successful strategies for preventing and mitigating the effects of disruptions in agro-food supply chains. Three themes emerged from the thematic analysis of interview data and review of organizational documents: collaboration among supply chain partners, business continuity management, and the use of a multiple supplier base. Agribusiness managers must first understand the sources of disruption risk, assess the impact of the risk, and then select an appropriate strategy based on the level of uncertainty and risk. By managing the risks effectively, managers can improve the performance and competitiveness of their businesses. The implications for positive social change may include a reduction in supply chain costs, provision of better services and products to consumers, and lower prices of agro-food products to consumers which could lead to an improvement in the lives of consumers.

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Dedication

I dedicate this academic accomplishment to the memory of my late father and mother, Elias and Miriam Karedzera, who instilled in me the importance of education and hard work. Your stories served as inspiration to me. I also dedicate this doctoral study to my husband Eilex, and children, Tinashe, Farai, and Tinotenda for their unwavering support, understanding, encouragement during my pursuit for this doctoral degree. Their amazing support and unconditional love during the many hours that I sat at our dining table working on the dissertation were critical to my success. I hope through what I have achieved academically and professionally, I have been able to teach my children that learning and growth are possible at any age.

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Section 1: Foundation of the Study

Agro-food supply chains are prone to disruptions due to their size, complexity, and dynamic nature (Chang, Ellinger, & Blackhurst, 2015). Supply chain disruptions adversely affect company performance measures such as service levels, cost, and responsiveness (Srivastava, Chaudhuri, & Srivastava, 2015). Organizational leaders need to protect firms from serious and costly disruptions (Chopra & Sodhi, 2014). Business managers can improve the performance and competitiveness of their businesses by managing disruptive risk effectively (Parihar & Rahul, 2014). Organizational leaders cannot avoid supply chain disruptions and therefore must put in place strategies to reduce their impact (Kumar, Himes, & Kritzer, 2014). The findings from this study could provide useful insights and information on the strategies for preventing and mitigating the effects of disruptions in agro-food supply chains.

Background of the Problem

Agro-food supply chain management is complex due to the perishable nature of products, dependence on weather conditions, fluctuations in demand and prices, and increasing consumer concerns for food safety (Shukla & Jharkharia, 2013). Although, supply chain management initiatives can result in more efficient and leaner operations, prevalent supply chain disruptions are detrimental to the performance of companies (Nyamah, Yi, Opong-Sekyere, & Nyamaah, 2014). Supply chain disruptions in organizations can result in revenue loss and have a negative impact on shareholder wealth (Macdonald & Corsi, 2013). Business leaders at Menu Foods Corporation in the United States lost about \$70 million as a result of recalls of 60 million cans of pet food contaminated with

undesirable chemicals from a supplier (Chen, 2014). Given the huge costs to companies, it is important for business managers to have strategies in place to prevent and mitigate the effects of supply chain disruptions.

Researchers conducted studies on the impact of disruptions in different locations of the supply chain network, and on company performance (Kaki, Salo, & Talluri, 2015). Some researchers focused on risk analysis and the impact of each risk on the supply chain (Dellana & West, 2016). Macdonald and Corsi (2013), Son and Orchard (2013), Parihar and Rahul (2014), Schlegel (2015), and Konig and Spinler (2016) addressed various issues related to supply chain vulnerability and risk mitigation. The results from these studies show that supply chains are prone to costly disruptions and it is necessary for business managers to assess supply chain risks and develop effective risk mitigation practices. Gaps exist regarding strategies for preventing and mitigating the effects of disruptions in agro-food supply chains. Through this research, agribusiness managers may implement strategies for preventing and mitigating the effects of disruptions in agro-food supply chains and improve supply chain performance.

Problem Statement

Disruptions in supply chains are common problems that inhibit competitiveness in agro-food value chains (Dries, Gorton, Urutyan, & White, 2014). Moderate to severe supply chain disruptions can lead up to a 107% drop in operating income (Alcantara, 2015) and a 12% decrease in shareholder returns (Chen, 2014). The general business problem is that agro-food supply chain disruptions have a negative effect on business sustainability and profitability. The specific business problem is that some agribusiness

managers lack strategies to prevent and mitigate the effects of disruptions in the agro-food supply chains.

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies agribusiness managers use to prevent and mitigate the effects of disruptions in the agro-food supply chains. The population of this study consisted of five agribusiness managers from two agro-food companies in the urban district of Harare, Zimbabwe. The agribusiness managers had implemented successful strategies for preventing and mitigating the effects of disruptions in agro-food supply chains. According to Wright and Datskovska (2013), implementing successful strategies results in organizations having lower costs and improved profitability. The contribution to positive social change may include a reduction in supply chain costs, provision of better services and products to consumers, and lower prices of agro-food products to consumers which consequently could lead to an improvement in the lives of consumers.

Nature of the Study

The research method for this study was qualitative. Qualitative research involves gaining a detailed understanding and in-depth knowledge of meanings, reasons, and patterns assigned by individuals to lived experiences and realities (Garcia & Gluesing, 2013; Guercini, 2014). My use of qualitative research was appropriate to explore how agribusiness managers prevent and mitigate the effects of disruptions in the agro-food supply chains. Researchers use quantitative research to test hypotheses, examine variables, and analyze statistical data (Frels & Onwuegbuzie, 2013; McCusker &

Gunaydin, 2015). A quantitative method was not appropriate because I was not seeking to test hypotheses, to examine variables, or compare variables' effects. The mixed methods approach involves combining statistical analyses of numerical data and thematic data (Golicic & Davis, 2012; Sparkes, 2014). A mixed methods approach was not suitable for this study, as this research would not require the integration of qualitative and quantitative techniques for data collection and analysis.

Qualitative research designs include ethnographic studies, narrative designs, case studies, and phenomenological research (Garcia & Gluesing, 2013; Singh, 2014). Researchers use the case study design for in-depth inquiry, and it is an appropriate design where a researcher seeks to answer *how, why, and what* questions (Singh, 2014; Yin, 2014). A case study research design is appropriate for understanding emerging ideas, real-life events, and situations that do not have a single set of outcomes (Yin, 2014). The qualitative case study design was the most appropriate research design for this study because my goal was to identify and explore the strategies that agribusiness supply chain managers utilize in preventing and mitigating the effects of agro-food supply chain disruptions. Narrative researchers focus on collecting data on participants' life experiences in a chronological manner (Green, 2013) which was not the intent of this study. Researchers use the phenomenological approach to understand the character and meaning of participants' lived experiences to a particular event from individual perspectives (Budd & Velasquez, 2014; Ziakas & Boukas, 2014). The phenomenological design was not suitable because the basis of this study was not on subjective individual viewpoints and interpretations from experiencing one or more phenomena. The

ethnographic research design involves studying shared beliefs of a group over time (Bamkin, Maynard, & Goulding, 2016; Zilber, 2014) and was therefore also not appropriate for this study.

Research Question

The overarching research question for this study was: What strategies do agribusiness managers use to prevent and mitigate the effects of disruptions in agro-food supply chains?

Interview Questions

Participants answered the following questions:

1. What strategies do you use to prevent disruptions in agro-food supply chains?
2. What strategies are most effective in mitigating the effects of disruptions in agro-food supply chains?
3. What barriers did you encounter in implementing the strategies for preventing disruptions to your supply chain network?
4. How did you address the barriers to the implementation of strategies for preventing disruptions to your supply chain network?
5. What processes do you use to minimize agro-food supply disruptions?
6. How do you assess the effectiveness of the strategies you use to prevent and mitigate the effects of supply chain disruptions?
7. What additional information can you provide on strategies to prevent and mitigate the effects of disruptions in agro-food supply chains?

Conceptual Framework

The contingency theory of fit (CTF) was the conceptual framework for this study. Van de Ven and Drazin proposed the contingency theory of fit in 1985 (Van de Ven & Drazin, 1985). The key tenets of the theory are that an outcome is a *fit* and is a result of multiple issues. Optimal decisions within a firm are contingent upon the internal and external issues and the firm's performance depends on how well organizational resources match the business environment. Therefore, there is no *one-size-fits-all* strategy, but the appropriateness of a mitigation strategy is dependent upon the internal and external environment (Van de Ven & Drazin, 1985).

According to Van de Ven and Drazin (1985), a supply chain disruption is a *lack of fit*. The effect of a supply chain disruption is minimal when a firm can organize efficient responses (Grotsch, Blome, & Schepler, 2013). In terms of the CTF, theorists posited that for efficient management of supply chain disruptions, managers need to understand the sources of uncertainty and then design a prevention and response effort focusing on management of information and material flows (Talluri, Kull, Yildiz, & Yoon, 2013). The CTF applied to this study because it served as the basis on which to prepare for, prevent and minimize the effect of a supply chain disruption. By using the CTF, researchers can focus on developing a framework to understand the different methods of preventing and mitigating the effects of supply chain disruptions (Brenner, 2014). Insight was also necessary to connect sustainable prevention and mitigation strategies for agro-food supply chains to both the external and internal environmental demands.

Operational Definitions

Agro-food supply chain: A system of organizations or individuals involved in moving agro-food products, services, and information from the farmer to the customer (Shukla & Jharkharia, 2013).

Information sharing: An interorganizational exchange of data, information and knowledge (Kembro & Naslund, 2014).

Risk management: A proactive approach business managers use to identify, analyze, and manage risks and uncertainties (Cagnin, Oliveira, Simon, Helleno, & Vendramini, 2016).

Supply chain collaboration: An interorganizational relationship where two or more partners are working together to align supply chain operations, share information, and build a value added process (Hofer, Hofer, & Waller, 2014).

Supply chain disruption: An unexpected event that results in an interrupted flow of goods and services in the supply chain and has negative consequences for normal supply chain operations (Tse, Matthews, Tan, Sato, & Pongpanich, 2016).

Supply chain management: A set of decisions for planning and executing operations of the supply chain with the purpose of delivering value to the customer and improving supply chain performance (Aggarwal & Srivastava, 2016).

Supply chain relationships: Interorganizational partnerships between buyers and sellers and their management leads to supply chain agility and responsiveness (Teller, Kotzab, Grant, & Holweg, 2016).

Supply chain resilience: An adaptive capability by organizational leaders in the supply chain to prepare, respond, and survive unexpected disturbances or events (Hohenstein, Feisel, Hartman, & Giunipero, 2015).

Assumptions, Limitations, and Delimitations

Assumptions

Assumptions are ideas that researchers believe to be true, but no adequate proof exists to support the beliefs (Schoenung & Dikova, 2016). The researchers' assumptions shape the research they conduct and influence the scope of inquiry and research findings (Kirkwood & Price, 2013). An assumption of this study was that the respondents would give honest and complete answers during interviews. It was possible that participants could provide biased and inaccurate information. The second assumption was that the agribusiness managers participating in this study would be able to provide information on strategies for preventing and mitigating the effects of supply chain disruptions. The third assumption was that the company documents would reflect an accurate and current position regarding the management of agro-food supply chain disruptions. I mitigated the risk associated with the assumption of document veracity by triangulating themes from document reviews and interviews. Additionally, I assumed that the data the study participants would provide would assist the reader to understand the strategies for preventing and mitigating the effects of agro-food supply chain disruptions.

Limitations

Limitations are potential weaknesses of the study that may decrease the reliability, credibility, and generalizability of research findings (Marshall & Rossman, 2016). The

primary limitation of this study was that the research was specific to agribusiness managers located in the urban district of Harare in Zimbabwe. Like other qualitative studies, restricting the research to a specific geographic location and to a specific industry limits the generalizability of the research findings to a larger population (Yin, 2014). The second limitation was that the sample size had only five agribusiness managers. A larger sample may have a different result (Boddy, 2016).

Delimitations

Delimitations are the set boundaries of a study (Merriam, 2014). Researchers define the parameters of the investigation to clarify what the study is not about (Barratt, Choi, & Li, 2011; Marshall & Rossman, 2016). According to Rusly, Corner, and Sun (2012), researchers impose restrictions or boundaries to focus the scope of the study. The set boundaries of this study were in learning, gaining a detailed understanding, and exploring the perceptions of agribusiness managers regarding their experiences in implementing strategies for preventing and mitigating the effects of agro-food supply chains. Another delimitation was the use of a multiple case study and restricting interview responses to five participants that were working in agro-food companies in Harare only. Agribusiness managers who worked outside the urban district of Harare were not eligible to participate in the study.

Significance of the Study

Contribution to Business Practice

Successful management of supply chain disruptions may lead to improvements in the performance of businesses (Parihar & Rahul, 2014). Business managers who can

manage disruption risk make their firms more resilient and competitive (Pettit, Croxton, & Fiksel, 2013). Organizational leaders can use competitive strategies to prevent and reduce supply chain disruption costs, and focus on value-adding activities to improve service, flexibility, and deliver best the value (Kumar & Nambirajan, 2013). The findings from this study could contribute to improving business practice by providing information that can reduce effects of disruptions in agro-food supply chains, as well as raise agribusiness managers' awareness and understanding of strategies for preventing and mitigating the effects of disruptions in agro-food supply chains. Supply chain practitioners in the agro-food industry could use the findings to explore the potential causes of disruptions in agro-food supply chains and implement prevention and mitigation strategies. Through this research, agribusiness managers can implement strategies and develop principles to improve supply chain sustainability and performance.

Implications for Social Change

Social change encompasses social issues that are of public concern that affect the welfare of individuals, communities, institutions, or society (O'Cass & Griffin, 2015). Successful businesses contribute effectively to the improvement of human and social conditions by creating jobs, participating in environmental sustainability programs, and contributing to economic growth (Polonsky, Grau, & McDonald, 2016). The implications for positive social change for my study include the potential for business managers to reduce supply chain costs, provide better services and products to consumers, and lower prices of agro-food products to consumers which consequently can improve the lives of consumers. Managers could also improve the standard of living for customers with lower

incomes because of the reduction in costs (Sekip-Altug & Van Ryzin, 2014). Prevention and mitigation of the effects of agro-food supply chain disruptions could lead to a reduction in economic loss and an improvement in the economic and social well-being of Zimbabweans (Macdonald & Corsi, 2013).

A Review of the Professional and Academic Literature

The focus of this qualitative multiple case study was to explore the strategies agribusiness managers use to prevent and mitigate the effects of disruptions in the agro-food supply chains. The overarching research question was: What strategies do agribusiness managers use to prevent and mitigate the effects of disruptions in agro-food supply chains? The purpose of the literature review was to provide the basis of inquiry to the overall research question. Researchers review the literature to build a logical framework for the research and add support to the research topic (Marshall & Rossman, 2016).

The strategy for literature review entailed a broad focus on causes and effects of supply chain disruptions to targeted strategies for preventing and mitigating the effects of disruptions in supply chains. The key topics of the literature review included the *contingency theory of fit, the phenomenon of disruptions in supply chains, and focused prevention and mitigation strategies*. The strategies included (a) supply chain design and management, (b) sustainable supply chain management, (c) resilient supply chains, (d) supply chain collaboration, (e) technology and supply chains, and (f) supply chain risk management. I searched various academic databases from the Walden University Library and from Google Scholar. Walden library research databases included Emerald

Management Journals, Business Source Complete, ABI/INFORM Global, SAGE Premier, ProQuest Central, and Science Direct. Key search words include *agro-food supply chains*, *supply chain management*, *preventing disruptions*, *mitigating disruptions*, *supply chain risk*, *technology and supply chains*, and *supply chain risk management*. The literature review section contains 159 journals, four books, two technical reports, and one dissertation. Of the 159 sources, 156(98%) are peer reviewed, and 148(93%) are published within 5 years of the expected completion date of study (2013-2017).

Contingency Theory of Fit

The theory underlying this study was CTF. The CTF serves as the basis to prepare for, and prevent and minimize the effects of supply chain disruptions (Talluri et al., 2013). Van de Ven and Drazin proposed the contingency theory of fit in 1985 (Van de Ven & Drazin, 1985). The CTF stems from the structural contingency theory. Lawrence and Lorsch (1967) developed the contingency approach to understand organizational subsystems and their environments. Lawrence and Lorsch studied the impact of the environment on organizational structure, and found that optimum organizational integration and differentiation was contingent upon the level of environmental uncertainty.

According to Lawrence and Lorsch (1967), the basis of optimal decisions within an organization are the internal and external factors. Critical theorists considered the structural contingency theory as too narrow with weak empirical support (Tarter & Hoy, 1998). Tosi and Slocum (1984) advocated for further research and development of the key parameters and notions surrounding the structural contingency theory. Business

leaders have recognized the CTF by Van de Ven and Drazin (1985) as a useful framework for managing supply chain disruptions. Van de Ven and Drazin posited that an outcome is a *fit* and is a result of multiple issues. Optimal decisions within a firm are contingent upon the internal and external issues and the firm's performance depends on how well organizational resources match the business environment (Talluri et al., 2013).

The three approaches to fit are (a) the interaction approach, (b) the selection approach, and (c) the systems approach (Van de Ven & Drazin, 1985). The systems approach to fit is an internal consistency of patterns of multiple contingencies and performance characteristics (Brenner, 2014). A selection approach to fit is an ecological process that has an impact on organizational survival (Talluri et al., 2013). The interaction approach to fit is the relationship between organizational context and structure and it is a useful framework that researchers use in examining correlations between the context and the specific organizational design characteristics (Hallavo, 2015). The concepts of selection and interaction are useful because supply chain managers can use different sets of strategies to prevent and mitigate the effects of various supply chain risks and enhance business performance (Chang et al., 2015). Managers can select different sets of strategies at different times to minimize disruptive risk in the supply chain. However, in selecting a particular strategy, managers need to match the organizational context and the available response strategy.

Supply chain disruptions affect chain operations and performance measures such as responsiveness, cost, and service levels (Srivastava et al., 2015). There is no one-size-fits-all strategy to manage uncertainties and risks, but the appropriateness of a mitigation

strategy is dependent upon the internal and external environment (Van de Ven & Drazin, 1985). The effect of a supply chain disruption is minimal when leaders in organizations can organize efficient responses (Grotsch et al., 2013). The CTF is a useful framework supply chain managers can use to develop long term responses to supply chain disruptions and to achieve supply chain stability.

In terms of the CTF, Talluri et al. (2013) posited that for efficient management of supply chain disruptions, managers need to understand the sources of uncertainty and then design a prevention and response effort focusing on management of information and material flows. Implementing an excellent information and material flow system reduces uncertainty and improves the performance of the supply chain (Riley, Klein, Miller, & Sridharan, 2016). Using survey data collected from 231 supply chain managers, Riley et al. (2016) found that managing information flows can bolster risk management capabilities of firms. The implication of the research findings are that managers can build collaborative communication networks to manage and mitigate risk in the supply chain.

Firms that operate under uncertain and risky conditions use mitigation strategies whose suitability and effectiveness are dependent on the internal and external environment (Talluri et al., 2013). Grotsch et al. (2013) used a similar theoretical view on mitigating risks and uncertainty. Grotsch et al. investigated the antecedents to proactive risk management implementation from a CTF perspective. Using past supplier insolvencies as a major contingency, Grotsch et al. stated that there is no appropriate accounting system that can apply to all organizations in all situations. Instead, particular aspects of an accounting system would depend on the firm's specific situation. Grotsch et

al.'s findings show that managers need to take a holistic risk management approach to mitigate supplier insolvency risk. Because firms operate in risky environments, managers need to analyze and understand the risks before selecting an appropriate mitigation strategy.

Hallavo (2015) empirically tested the CTF in the context of the supply chain uncertainty by aligning firm operations with both the internal and external environment. Using a hierarchical regression model to analyze a cross-sectional survey sample of 875 Russian manufacturing firms, Hallavo found out that matching the level of operational effectiveness with the external and internal environment leads to superior company performance. Chang et al. (2015) utilized the CTF to examine alternative supply chain risk mitigation strategies with specific risk contexts. Chen et al.'s framework is useful to supply chain managers in that they can choose the relevant risk mitigation strategies based on the context and structure of the risk. Given the applicability of the CTF to supply chain risk mitigation, I anchored my work in the domain and evaluated the different strategies for preventing and mitigating the effects of agro-food supply chain disruptions.

Contrasting Theories

Contrasting theories researchers explored in studies relating to mitigation of supply chain disruptions include (a) the normal accident theory (NAT) and (b) the resource dependency theory (RDT; Bowman, 2015). NAT theorists view disasters or accidents as inevitable due to interactive complexity in organizations (Marley, Ward, &

Hill, 2014). The focus of the resource dependency theory (RDT) is on the ability of leaders in an organization to acquire external resources (Wolf, 2014).

Normal Accident Theory. Perrow (1999) developed the NAT to describe the conditions that contribute to risk situations. The key tenets of the theory are that accidents are inevitable and are a result of a system's interactive complexity and tight coupling (Marley, et al., 2014). Failures happen in unexpected ways and to prevent their occurrence, managers must increase slack or reduce complexity (Perrow, 1999). The conditions of interactive complexity and tight coupling are antecedents to supply chain disruptions (Yang & Yang, 2010). Identifying the precursors and how interactive complexity and tight coupling influence disruption occurrence is beneficial to supply chain managers in determining alternative mitigation strategies.

In terms of the NAT, theorists posited that by reducing the level of interactive complexity, organizations could become less vulnerable to supply chain disruptions (Marley et al., 2014). Yang and Yang (2010) suggested that by reducing interactive complexity, problems become more visible and consequently there are fewer supply chain disruptions. The major limitation of the NAT is that researchers have not yet tested the dimensions of interactive complexity and tight coupling empirically (Marley et al., 2014). From an organizational perspective, the challenge for managers is to acquire the capacity to cope with interactive complexity and tight coupling simultaneously. I did not select the NAT as my conceptual framework because of its limited applicability in an organizational context.

Resource Dependency Theory. Pfeffer and Salancik (1978) posited that organizational performance depends on the level of its reliance on critical resources. Pfeffer and Salancik explained that organizational leaders could reduce uncertainty by acquiring external resources. In terms of the RDT, Wolf (2014) contended that organizational leaders can acquire external resources by developing supply chain relationships. Supply chain managers depend and collaborate with external organizations to pursue higher organizational performance (Soosay & Hyland, 2015). Chen and Fung (2013) examined the relationship managers form with customers and suppliers in the supply chain from an RDT perspective. Chen and Fung's findings show that information sharing among supply chain partners can reduce uncertainty when conducting business in the external environment. I did not select the RDT as my conceptual framework because it did not have a solid foundation to understand the different strategies of preventing and mitigating the effects of supply chain disruptions.

Supply Chain Disruptions

Supply chains are increasingly becoming complex and vulnerable to disruptions. Supply chains exist in multiple geographic regions, and as a result, local firms are prone to operational risk and unpredictable disruptions (Tse et al., 2016). Disruptions in supply chains occur more frequently and are becoming a problem in the global marketplace (Hurn, 2013). According to the Business Continuity Institute (2013), 75% of the respondents from 71 countries experienced at least one major supply chain disruption in 1 year. In the United States, about 600 companies suffered a supply chain disruption leading to at least a 9% reduction in stock price between 1998 and 2007 (Wildgoose,

Brennan, & Thompson, 2012). Because of the frequent occurrence of supply chain disruptions, managers need to consider various strategies to prevent and minimize their effects.

Supply chain disruptions may occur as a result of droughts, earthquakes, hurricanes, and civil wars (Iakovou, Vlachos, Keramydas, & Partsch, 2014). Supply chain disruptions may also be as a result of various factors including (a) poor communication between suppliers and manufacturers, (b) labor strikes, (c) government regulations, (d) acts of terrorism, (f) information technology (IT) malfunctions, (e) quality problems, (f) operational problems, and (g) industrial accidents (Macdonald & Corsi, 2013). Pradhan and Routroy (2014) identified delivery performance, business practices, rework, and demand supplier fluctuations at the supplier as major risk categories for manufacturing companies. Because potential disruptions are a result of risks that are unplanned, managers need to assess the triggers of these risks and mitigate the impact of the supply chain risk.

Supply chain disruptions that are demand driven are due to customer demand volatility, insolvency, and distribution flow problems (Schlegel, 2015). Process disruptions that could occur within the organization include (a) system glitches, (b) time delays, (c) inventory shortages, (d) quality problems, and (e) supply chain visibility (Schlegel, 2015). After an extensive review of current research, Konig and Spinler (2016) explained that supply chain disruptions might also be a result of supply chain management activities including outsourcing, technological innovations, fluctuations in demand, and reduction in inventory. Outsourcing of global business and inventory

management methods, for example, just in time (JIT) may also lead firms to become vulnerable to unpredictable disruptions (Kumar et al., 2014; Tse et al., 2016). Inadequate visibility of the supply chain is another huge risk to businesses (Yao, 2013). Business managers can review strategically on what they want to outsource and assess whether their vendors have the right people, processes, and technology to support the firm's business functions.

Agro-food supply chains have inherent disruption risks due to unstable environmental issues (Shukla & Jharkharia, 2013). The major risk categories include (a) biological and environmental risks such as pests and diseases, (b) market-related risks that include volatile customer demand and fluctuations in input price, (c) poor infrastructure, (d) weak institutional capacity to implement institutional mandates, and (e) financial risks relating to exchange rate and interest rate policies (Nyamah et al., 2014). In support of Nyamah et al. (2014), Tse et al. (2016) opined that demand uncertainty, an uncertainty of product quality, and logistics uncertainty could lead to the disruption of normal flow of goods in agro-food supply chains and an increase in costs.

In a study of cold food chains in Germany, Brenner (2014) identified some of the principal causes of food supply chain disruptions including (a) long transport distances, temperature deviations during loading and unloading, (b) inadequate food control, (c) lack of standardization of traceability systems, (d) sanitary and pesticide violations, and (e) fluctuations in supply performance. Srivastava et al. (2015) conducted a quantitative study to examine the potential supply chain risks and performance measures in fresh food retail. Srivastava et al. noted the perishability nature of products as an important source of

risk in agro-food supply chains. The perishability of many food products is a result of conditions of storage, processing, and transport at all the stages of the supply chain (Chaudhuri, Srivastava, Srivastava, & Parveen, 2016). Other risk drivers unique to the food industry are cross-contamination in stores and logistics, failure to communicate with customers, lack of traceability, internal process errors at customer interface, and unsold inventory (Srivastava et al., 2015). Consequently, there is a need for business leaders to increase the operational efficiency in the agro-food supply chain and minimize food supply chain disruptions.

Effects of Supply Chain Disruptions. The impact of supply chain disruptions can be costly and can have a negative effect on both the organization's operations and the supply chain. Hazard risks such as natural disasters, plant fires, and explosions tend to occur less frequently, but they have a significant impact on the organization (Schlegel, 2015). Supply chain disruptions can result in the suspension of both the upstream and downstream operations of the supply chain (Son & Orchard, 2013). The March 2011 earthquake and tsunami in Japan resulted in high casualties, property losses and adversely affected the flow of goods in the global automobile industry (Chang et al., 2015). The estimated financial impact of the tsunami was over US\$300 billion (Chakravarty, 2013). Japanese assembly plants closed for a month because of the unavailability of critical components (Chopra & Sodhi, 2014). Furthermore, the management of Hitachi's automotive systems factory suspended operations resulting in a temporary curtailment of vehicle production in Germany, France, Spain, and USA (Chang et al., 2015). Because

disasters have far reaching influence on domestic manufacturers and companies in multiple countries, business managers should have detailed plans for dealing with supply chain disruptions.

Disruption of the global supply chain could have severe economic and financial consequences. The estimated global economic impact of both natural and man-made disasters is about US\$ 960 billion (Iakovou et al., 2014). The April 2010 volcano in Iceland resulted in a revenue loss of US\$5 billion to the global air travel industry (Konig & Spinler, 2016). A high-tech, deep-water oil well explosion in the Gulf of Mexico in 2010 had an estimated financial impact of \$40 billion (Chakravarty, 2013). Similarly, in 2011, widespread floods in Thailand submerged sensitive semiconductor plants and resulted in revenue losses for Japanese auto companies that had manufacturing plants in Thailand (Chopra & Sodhi, 2014). These examples show that not only is effective risk scanning necessary but managers should put in place a proactive plan for risk mitigation.

Poor management of a single supplier or lack of financial support could have a disruptive effect on an organization (Dellana & West, 2016). General Motors had a revenue loss of about US\$800 million as a result of a labor strike from a key supplier (Chakravarty, 2013). A sustained disruption can lead to a company shut down (Kumar et al., 2014). Ericsson lost US\$400 million in revenue, and Ericsson's management closed the handset business as an independent manufacturer after a supply chain disruption in 2000 (Chakravarty, 2013). In 2001, UPF Thomson, the sole supplier of the chassis frame for Land Rover went bankrupt, and leaders in Land Rover had to pay \$35 million to manage the disruption (Dellana & West, 2016). Using a quantitative event study

methodology, Kumar, Liu, and Scutella (2015) analyzed 301 supply chain disruptions in India from 2003-2012 and found that disruptions led to a drop of 2.88% in stockholder wealth. In a different study, Schlegel (2015) noted that a moderate to severe disruption could lead up to a 107% drop in operating income, 6.9% reduction in sales growth, and 10.66% increase in cost.

Supply chain risks in the agro-food industry may result in recalls and have a significant effect on company performance. In October 2014, leaders at Parle Products in India recalled their entire stock of candy product, *mango bite* from the market because of the use of buffered lactic acid in the manufacturing process (Chaudhuri et al., 2016). Similarly, Nestle India's managers recalled \$50 million worth of Maggi noodles in April 2015 due to the high presence of lead and monosodium glutamate (Chaudhuri et al., 2016). Given the huge costs to companies, it has become important for organizational leaders to have strategies in place to prevent and mitigate the effects of supply chain disruptions.

The actual cost of a supply chain disruption is not just the lost revenue and the production and product quality problems, but there are strategic and marketing consequences (Zhao, Huo, Sun, & Zhao, 2013). Supply chain disruptions can result in a reduced brand value, erosion of customer loyalty, and loss of customers that diversify their supply (Chakravarty, 2013). Disruptions in a supply chain may also result in loss of exclusive customer relationships when customers switch to competitor products (Chakravarty, 2013). The evolving risks in the supply chain and the associated costs are

of concern to most organizational leaders and managing the risks are the primary goals for survival in the market.

Supply Chain Design and Management

A supply chain is a set of organizations or individuals involved in the flow of products, services, and information from the main manufacturer to the customer (Kembro & Naslund, 2014). The activities in a supply chain involve the procurement of raw materials, the transformation of raw materials into final products, and the distribution of the commodities to customers (Prasad, Subbaiah, & Rao, 2014). Supply chains are multi-dimensional consisting of informational, financial, and relational aspects and as such; include both physical activities and behavioral dimensions (Pitt, Chotipanich, Amin, & Issarasak, 2014). In addition, supply chains are not static, but they vary in size, shape, and configuration due to factors such as technological changes, an emergence of new products, new market niches, and geographical markets (MacCarthy, Blome, Olhager, Srai, & Zhao, 2016). Therefore, supply chain leaders need to recognize how globalization, technology, and changing markets affect the performance of their organizations and supply chains.

Supply chain design refers to decisions regarding operating facilities, inventory, transportation, and information flow in the supply chain (Prasad et al., 2014). Given the competitive business environment, it is critical for supply chain managers to align supply chain activities with the competitive strategy and strategic objectives of the organization (Stevens & Johnson, 2016). Utilizing the contingency theory of fit as the conceptual framework, Arora, Arora, and Sivakumar (2016) examined the relationship between

supply chain strategies and operational and relational outcomes of organizational performance. Arora et al. found that supply chain transformation occurs when firms are truly integrative and collaborative. Supply chain collaboration and integration practices based on relational ties, tend to result in trust and better coordination among supply chain partners (Arora et al., 2016). Arora et al. concluded that the supply chain mix effects both the internal environment of the focal firm and the external environment of customers, competitors, suppliers, and supply chain partners. This would result in supply chain management effectiveness, organizational performance, and sustainable competitive advantage (Arora et al., 2016). Supply chain competitiveness is a result of cooperation, collaboration, and coordination among supply chain partners (Braziiotis, Bourlakis, Rogers, & Tannock, 2013; MacCarthy et al., 2016). Integration of resources, information sharing, and transactions across traditional boundaries are essential in gaining competitive advantage in the supply chain (Chaudhuri, Mohanty, & Singh, 2013). Thus, organizational leaders with good communication and relational ties can integrate information sharing activities and processes to enhance supply chain management.

Supply chain management is a set of decisions for planning and executing operations of the supply chain (Kumar & Nambirajan, 2013). The supply management process is a set of synchronized decisions, and activities managers utilize to efficiently integrate suppliers, manufacturers, transporters, retailers, and customers to minimize system-wide costs while meeting customer demand (Prasad et al., 2014). Supply chain managers coordinate material and information flows within and among supply chain partners (Pashaei & Olhager, 2015). Supply chain management is a major source of

competitive advantage (Barros, Barbosa-Povera, & Blanco, 2013; Shamah, 2013). Supply chain managers need to minimize costs, improve service interaction with supply chain partners, and improve flexibility in supply chain activities to compete in the global market, (Tarofder, Marthandan, Mohan, & Tarofder, 2013). Thus, organizational leaders who focus on structuring business functions to integrate supply chain activities can secure competitive advantage and deliver value to their customers.

Effective supply chain management is necessary because of globalization, changing markets, and intense competition in the market place. Supply chain managers need to integrate the activities of suppliers, manufacturers, transporters, retailers, and customers to reduce supply chain costs while satisfying customer service-level requirements (Cruz, 2013). Braziiotis et al. (2013) recommended that supply chain managers should focus on coordinating material flows and activities of other organizations to increase performance and competitiveness in the supply chain. Using the Australian beef processing industry as an example, Jie, Parton and Cox (2013) examined the relationship between management actions and process improvements in the supply chain. Jie et al. found that trust, supplier relationships, and information quality are important drivers of the agro-food supply chain process and can lead to a sustainable competitive advantage.

One of the important elements of supply chain management is supply chain performance (Huo, Qi, Wang, & Zhao, 2014). Supply chain performance is a systematic process that managers use to measure the effectiveness and efficiency of supply chain operations (Sundram, Chandran, & Bhatti, 2016). Supply chain managers assess supply

chain performance to encourage service excellence and global optimization along supply chain channels (Ibrahim & Hamid, 2014; Sundram et al., 2016). By using supply chain performance measurement, supply chain managers can promote collaborative integration among supply chain partners and ensure continuous improvement of the supply chain.

Supply chain managers seeking to improve resource efficiency in their supply chains should develop a set of resource indicators, implement flexible production systems, and supply chain management practices (Matopoulos, Barros, & Van Der Vorst, 2015). Supply chain management practices refer to activities that organizational leaders undertake to promote efficient management of the supply chain (Barros et al., 2013). Min and Mentzer (2004) identified seven components of supply chain management practices: (a) supply chain leadership, (b) agreed on vision and goals, (c) exchange of information, (d) risk and award sharing, (e) long-term relationship, and (f) process integration and cooperation. Ibrahim and Hamid (2014) identified the use of information technology as an additional aspect of supply chain management practice. Odongo, Dora, Molnar, Ongeng, and Gellynck (2016) further supported that information sharing and strong and mutual relationships with supply chain members are important supply chain management practices that supply chain managers employ to achieve a well-integrated supply chain.

In contrast Lii and Kuo (2016) and Seo, Dinwoodie, and Kwak (2014) argued that business leader's innovativeness is an important driver in leveraging supply chain performance because it results in a more sophisticated management of information and material flows along the supply chain. Organizational leaders stimulate innovativeness internally by encouraging employees and executives to exploit new behaviors and

practices (Seo et al., 2014). Utilizing quantitative survey data of 102 South Korean manufacturers, Seo et al. observed that innovativeness in the supply chain has a positive impact on both supply chain integration and supply chain performance. Thus, organizational leaders can pursue a high level of integration to improve supply chain performance.

Supply chain management practices can have significant direct positive effects on supply chain performance (Odongo et al., 2016). Sundram et al. (2016) studied the relationship between the different components of supply chain practices and supply chain performance in the Malaysian electronics sector. Sundram et al. observed that information quality, agreed on vision and goals, supply relationships, and information sharing are crucial management practices managers employ to enhance supply chain performance. In a quantitative study of 110 manufacturing companies in Sudan, Ibrahim and Hamid (2014) observed that supplier management practices that include (a) information sharing, (b) customers and delivery management, (c) supplier management, and integration had significant positive effect on supply chain performance.

To investigate the key supply chain processes and their implications on competitive performance outcomes, Prajogo, Oke, and Olhager (2016) collected and analyzed data from 232 Australian manufacturing firms. Prajogo et al. found that supply logistics integration and lean production processes result in competitive supply chain performance. Using quantitative survey data of 150 agribusiness companies in the maize supply chain in Uganda, Odongo et al. (2016) also observed that supply chain practices have a positive effect on supply chain performance. The implication of these findings is

that organizational leaders should pursue tailored supply chain practices to improve supply chain performance.

One of the difficulties supply chain managers face is selecting the right supply management practices to improve business performance (Barros et al., 2013). Barros et al. (2013) identified six phenomena that have a negative impact on supply chain performance: (a) uncertainty, (b) waste, (c) congestion, (d) bullwhip effect, (e) diseconomies of scale, and (f) self-interest. Anastasiadis and Poole (2015) examined emergent supply chain management practices through an analysis of the predisposition and interactions of market players at each stage of the agro-food supply chain. Anastasiadis and Poole found that different entrepreneurial mentalities and minimal trust among stakeholders had a negative impact on supply chain performance. Barros et al. developed a method for selecting the supply management practices using a functional strategy map and the five steps include (a) documentation of supply chain practices, (b) measuring phenomena, (c) improvement opportunity, (d) selection of tailored practices, and (e) implementation. Although Barros et al. did not verify the completeness of the phenomena, the proposed method is a useful diagnosis and continuous improvement tool that supply chain managers can use.

Sustainable Supply Chain Management

Organizational leaders are integrating sustainability issues into many aspects of supply chain management. Sustainability and environmental issues are among the most pressing concerns for environmentally conscious organizational leaders (Hsu, Tan, Zailani, & Jayaraman, 2013). Many leaders pursue sustainable practices because of the

risks they may face if they do not act (Silvestre, 2016). The risks include penalties for non-compliance to government regulations (Laosirihongthong, Adebajo, & Tan, 2013), supply chain disruptions, and pressures from NGOs and other stakeholders (Silvestre, 2016). The other stakeholders include government, community groups, investors, suppliers, customers, and employees (Hsu et al., 2013). Consumers have become more critical to quality and safety of food production systems and managers in the agro-food industry are responding to these changing consumer demands by increasing sustainability of processes and products (Shukla & Jharkharia, 2013). These factors raise economical, environmental, and social concerns that can have an impact on the performance of firms and their supply chains.

Sustainable supply chain management (SSCM) refers to how supply chain managers coordinate material, information, and capital flows and make decisions on the basis of economic, environmental, and social concerns (Beske & Seuring, 2014; Tseng, Lim, & Wong, 2015). Schaltegger and Burritt (2014) described SSCM as a process where managers address the challenges of sustainability risks from a business and value-chain perspective to improve sustainable supply chain performance. In SSCM, managers should focus on integrating and achieving social, environmental, and economic goals to improve the long-term performance of the individual firm.

Many business managers are adopting green supply chain initiatives beyond their organizations. Supply chain managers consider SSCM issues not only for their organizations but also for their supply chain members (Ahmad, de Brito, & Tavasszy, 2016). To identify key categories of sustainable supply chain management (SSCM) and

related practices Beske and Seuring (2014) conducted a systematic literature review and analyzed the different SSCM approaches. Beske and Seuring identified five key categories for SSCM: (a) orientation towards supply chain management and sustainability, (b) continuity, (c) collaboration, (d) risk management, and (d) pro-activity. Beske and Seuring found that the specific practices include partner selection, long term relationships, technological integration, enhanced communication, standards and certification, innovation, stakeholder management, and life-cycle assessment. These findings are similar to Wu, Liao, Tseng, and Chiu (2016) who observed that the recurring SSCM practices include (a) long-term relationships, (b) collaboration among supply chain partners, (c) supplier development, (d) an increase of communication among supply chain partners, and (e) top management support.

SSCM has a significant effect on an organization and the bottom line. Some organizational leaders have been able to improve financial performance, reduce costs and resource consumption through recycling and waste management (Ortas, Moneva, & Alvarez, 2014). Ortas et al. (2014) conducted causality tests on a large, diverse sample of 3 900 companies from 2004 to 2011. Moneva et al. observed a bidirectional causality between sustainable supply chain performance and company margins and revenue. Through SSCM, supply chain managers can reduce the risk of litigations, improve corporate image, and environmental performance.

Business managers can integrate environmental and social issues into their corporate strategies, increase firm competitiveness and performance, and achieve better customer service (Tseng et al., 2015). Another benefit is the long-term viability of the

organization in the supply chain (Akhtar, Tse, Kan, & Rao Nicholson, 2015). Moreover, companies with environmental supply chain policies tend to have increased supply chain flexibility and enhanced profits (Lee, Rha, Choi, & Noh, 2013). Since sustainable supply chain performance is a key aspect of SSCM, additional benefits arising from sustainable supply chain performance include improved efficiency, higher product quality, access to new markets, increased employee motivation and satisfaction, lead on competitors, and better organizational reputation (Ortas et al., 2014). SSCM is now a critical tool that leaders in organizations can use to improve corporate image and social and environmental performance.

Supply Chain Collaboration

Supply chain collaboration is becoming an important tool organizational leaders use to reduce uncertainty, and achieve competitive advantage and business success (Aggarwal & Srivastava, 2016). Supply chain collaboration refers to an inter-organizational relationship where two or more supply chain partners are working together to align supply chain operations, share information, and build a value added process (Hofer et al., 2014). The main components of supply chain collaboration include synchronized decision making, information sharing, collaborative communication and knowledge creation, and goal sharing (Scholten & Schilder, 2015). The basis of collaboration is mutual trust, shared rewards and risks that result in greater profitability and better performance (Soosay & Hyland, 2015). Collaboration has three dimensions: (a) coordination, (b) adaptation, and (c) relationship building and the goal is to share benefits and improved outcomes (Arora et al., 2016). The main types of collaboration

include strategic alliances, networks, joint ventures, and cooperative arrangements (Soosay & Hyland, 2015).

Organizational leaders are striving for greater supply chain collaboration to secure maximum benefits from collaborative partnerships. Firms are under intense competition, and supply managers need to consider various capabilities and value creation strategies for their customers (Soosay & Hyland, 2015). Leaders in organizations are collaborating across boundaries because of the need to improve higher service levels, increase greater end-customer satisfaction, explore opportunities, and access resources, knowledge, and information (Kumar & Banerjee, 2014). Managers are seeking for more integrative and collaborative efforts due to evolving technologies, the need to cope with high demand uncertainties, and the need to share costs and risks (Kache & Seuring, 2014). In a study of the drivers and patterns of supply chain collaboration in China's pharmaceutical industry, Huang, Lin, Ieromonachou, Zhou, and Lou (2015) found that business managers engaged in collaborative activities to save costs, pool and spread risk, and to have the flexibility to respond to market requirements.

Using structural analysis of dyadic survey data from 160 suppliers and retailers of consumer packaged goods in Brazil, Hofer, Hofer, and Waller (2014) examined the drivers of retailer-supplier collaboration and its impact on both the supplier and the retailer. Hofer et al. (2014) explained that customer orientation and more supplier specific relationships lead to greater retailer-supplier collaboration. Hofer et al. also observed a direct positive relationship between supplier's customer orientation and company performance. Hofer et al. concluded that retailers benefit the most from a supplier's

collaboration efforts. Therefore, business leaders should use supply chain collaboration more strategically and create more new revenue opportunities.

Supply chain collaboration can lead to superior performance in companies due to capitalization of resources, capabilities, and processes that are in supply chain partners (Soosay & Hyland, 2015). Supply chain partners collaborate to maximize learning opportunities and develop new competencies, to better position themselves in the market and improve the agility and performance of the supply chain (Cai, Goh, de Souza, & Li, 2013). Collaboration for recovery is an important strategy business leaders use for responding quickly to supply chain disruptions and mitigating harmful impacts (Zhu, Krikke, & Caniels, 2016). By creating positive partnerships, business leaders leverage collaboration and resources that competitors cannot imitate (Qrunfleh & Tarafdar, 2013). Thus, supply chain collaboration can be a major tool supply chain managers may use to maintain a supply chain's competitive position.

Aggarwal and Srivastava (2016) conducted in-depth interviews with upstream supply chain members in the Indian agro-food industry to understand the process of supply chain collaboration and to capture the collaborative practices and perceptions of buyers and suppliers. Aggarwal and Srivastava found that supplier selection, joint planning, and information sharing are the main antecedents of supply chain collaboration while supply chain efficiency and waste reduction are the major outcomes of collaboration. In a different study, Kache and Seuring (2014) examined the link between collaboration and supply chain performance and observed a direct positive relationship between the degree of collaboration within the supply chain and the overall supply chain

performance. The implication of the research results is that developing collaborative practices not only results in benefits for buyers and sellers, but can lead to better and sustainable practices for the industry.

As customers demand quality products at lower costs, the need for organizational leaders to collaborate in creating innovative products is now imperative. Leaders in organizations collaborate in innovation and new product development to realize various benefits such as lower cost, high quality, reduced cycle time, and efficient operations (Soosay & Hyland, 2015). The ability to accept innovations and take advantage of synergy effects is a key competency for collaborative firms (Knoppen, Johnston, & Saenz, 2015). Manufacturers increasingly depend on innovation from their suppliers and therefore managers can consider knowledge transfer as a key supplier selection criterion.

Supply chain collaboration is a critical business strategy in today's business environment. Information sharing can be between the focal company and its customers, suppliers, or between more than three parties along the supply chain (Cai et al., 2013). The benefits of information sharing include (a) reduction in inventory levels, elimination of stock outs, and (c) product flow improvement (Zhou & Piriathu, 2013). Increased information sharing between supply chain members can lead to higher levels of trust between supply chain partners and an improvement in working relationships (McDowell, Harris, & Gibson, 2013). Therefore, sharing knowledge and information among supply chain partners can be an effective strategy for improving supply chain performance.

Supply chain members share information such as short-term forecasts, inventory levels, delivery schedules, production planning, market trends, and long-term logistics

strategies (Kembro & Naslund, 2014.) Utilizing a systematic literature review of journal articles from 2000 to 2012, Montoya-Torres and Ortiz-Vargas (2014) examined the impacts of information sharing and collaboration strategies on the supply chain.

Montoya-Torres and Ortiz-Vargas found out that the type of information shared in dyadic supply chains is on product structure and design, inventory levels, and the planning process. About 83% of the articles were on solving operational problems such as order replenishment or product delivery (Montoya-Torres & Ortiz-Vargas, 2014). Thus, collaboration is more at the tactical level rather than strategic decision-making level.

Interorganizational relationships have a major role in minimizing the effects of supply chain uncertainty (Teller et al., 2016). Business leaders form and maintain tighter vertical coordination of the supply chain to reduce business uncertainty and improve access to essential resources (Dries et al., 2014). Strategic supplier partnerships are becoming more important because managers can plan effectively and improve supply chain responsiveness (Storer, Hyland, Ferrer, Santa, & Griffiths, 2014). Teller et al. (2016) examined the impact of key supplier relationship management (KSRM) in the upstream supply chain on successful supply chain management. Teller et al. interviewed 174 managers from different supply chain stages and found KSRM as a key variable affecting the level of supply chain management implementation within a company.

In a study of 205 managers from manufacturing firms in the United States, Qrunfleh and Tarafdar (2013) observed a direct link between supplier partnerships and supply chain responsiveness. In a different study of 2,400 supply chain participants in the Australian beef industry, Storer et al. (2014) discovered a positive relationship between

strategic supply chain relationships and the responsiveness of the agro-food supply chain. Additionally, strategic supply chain capability and industry-led innovation utilization can lead to beneficial agro-food supply chain outcomes (Storer et al., 2014).

In collaborative inter-firm relationships, trust and communication are significant factors for supply chain agility (Durach, Wieland, Jose, & Machuca, 2015). The existence of trust in a relationship can result in relationship sustainability and competitive advantage (Gambetti & Giovanardi, 2013). Trust is a fundamental asset in long-term relationships and is crucial in the supply chain process (Paiva, Teixeira, Marques, & Finger, 2014). The level of trust that buyers develop towards their suppliers is a result of effective communication, positive past collaboration, and the existence of personal bonds (Fischer, 2013; Revilla & Knoppen, 2015). Zeng, Anh, and Matsui (2013) analyzed data from 238 manufacturing firms and observed a direct link between communication and management practices. Utilizing survey data of 335 respondents from three industries Paiva et al. (2014) identified a direct positive relationship between trust based relationship, communication, and supply chain planning. Gambetti and Giovanardi (2013) argued that the exchange of information and mutual relationship sharing can lead to commitment and trust among supply chain partners. Consequently, knowledge and information flow can result in more transparent buyer-supplier relationships and can have a significant impact on supply chain performance.

Supply chain collaboration can fail due to behavioral and organizational factors. Business managers may not share information because of the low level of trust among supply chain partners (Soosay & Hyland, 2015). Sharing risk and rewards among supply

chain partners is a key aspect of collaborative relationships. Therefore, an unwillingness to share benefits with upstream and downstream partners can lead to a breakdown in collaboration efforts (Zhu et al., 2016). Fawcett, McCarter, Fawcett, Webb, and Magnan (2015) conducted a qualitative multiple case study of 15 companies to explore why collaboration strategies fail. Fawcett et al. observed that cross-functional conflicts, strategic misalignment, poor systems connectivity, information hoarding, low trust, and resistant to change can lead to a lack of collaboration among supply chain partners. In a different study, Ramesh, Banwet, and Shankar, (2010) identified high costs of sharing information, a disparity in technological capability among supply chain partners, and lack of top management support as major obstacles to effective supply chain collaboration. Such constraints may lead to a lack of supply chain visibility, competitive advantage, and well-aligned goals.

Organizational leaders are increasingly tackling issues of sustainability. Environmental sustainability practices not only reflect environmental responsibility towards society but are critical to organizational leaders who aim to improve competitiveness and minimize the risk of business interruption (Chen, Wu, & Wu, 2015). Business leaders adopt collaborative environmental innovations with supply chain partners to eliminate adverse environmental impacts, deliver safe consumer products and in the process improve their performance and influence their market position (Chen et al., 2015). Thus, green practices are critical in improving competitiveness in the market place.

Business managers focus on environmental collaboration to design environmentally sound products and processes (Hsu et al., 2013). To investigate the performance benefits of the alignment of sustainability-related downstream and upstream collaboration, Blome, Paulraj, and Schuetz (2014) conducted a survey of 259 European manufacturing firms and analyzed the mediation and moderation effects. Blome et al. found that supply chain initiatives do pay off and the firm's internal sustainable production positively relate to the alignment of performance measures. However, firms tend to benefit from co-aligned sustainability collaboration with other supply chain members if organizational leaders dedicate resources systematically both towards sustainability collaboration and internal sustainability practices (Chen et al., 2015). Supply chain collaboration toward environmental pro-activity is necessary for supply chain partners to minimize the risk of business interruption and to sustain innovation for future markets.

Supply Chain Resilience

Supply chain resilience is a priority issue for many companies due to increasing uncertainty and disruptions in supply chain operations (Birkie, 2016; Mandal, 2014). Supply chain resilience refers to an adaptive capability of organizational leaders in the supply chain to prepare, respond, and survive unexpected disturbances or events (Hohenstein et al., 2015). Resiliency is not a state, but it is a dynamic set of conditions within a system (Roberta Pereira, Christopher, & Lago Da Silva, 2014). Business managers can mitigate risks and disruptions in the supply chain by building resilient supply chains (Golgeci & Ponomarov, 2013). Because disruptions are unanticipated

events, managers that have good operational resilience capabilities can prepare, respond, and recover from supply chain disruptions (Scholten, Scott, & Fynes, 2014). Business managers may use resiliency as a tool to adapt and sustain business in a turbulent environment.

Researchers viewed supply chain resilience from many different angles. The major components of supply chain resilience are (a) supply chain agility, (b) supply chain flexibility, and (c) supply chain collaboration (Mandal, 2014). Durach et al. (2015) identified the dimensions of supply chain resilience as agility and robustness. Hohenstein et al. (2015) carried out an extensive literature review of peer-reviewed articles from 2003 to 2013 and synthesized the various supply chain resilience strategies for mitigating supply chain disruptions. Hohenstein et al. found flexibility, collaboration, redundancy, visibility, agility and multiple sourcing as the most crucial elements of supply chain resilience.

Utilizing the dynamics capabilities theory as the theoretical framework, Golgeci and Ponomarov (2013) examined the antecedents of supply chain resilience. Golgeci and Ponomarov observed that firm innovativeness and innovation magnitude positively influence supply chain resilience. Innovative organizational leaders are more likely to establish a desired level of supply chain resilience which is a key capability for surviving disruptions (Golgeci & Ponomarov, 2013). Organizational leaders should invest in innovative capabilities to secure a competitive advantage, increase market share, and respond to disruptions and other risks.

Supply chain agility refers to a quick response to rapid changes in market supply and demand (Gilgor, 2014). Supply chain agility is a reactive strategy where supply chain managers adjust operations to cope with disruptions in the supply chain (Durach et al., 2015). Managers may use demand management to achieve supply chain agility (Hohenstein et al., 2015). Demand management is a management process where managers match customers' requirements with supply (Lee & Rha, 2016). To investigate the relationship between demand management and supply chain agility, Gilgor (2014) reviewed the literature on manufacturing, marketing, distribution, procurement, and supply chain agility from 1991 to 2013. Gilgor noted that leaders in firms need flexible manufacturing, distribution and procurement systems, and flexibility in managing demand to achieve supply chain agility. Business managers should focus on demand and supply integration inside the firm to achieve supply chain resilience.

Supply chain disruptions are more critical when they occur upstream in the supply chain, and as such procurement is becoming a major business activity. Procurement refers to a boundary spanning function where managers seek to align and synchronize internal requirements to external resources to achieve firm targets and competitive advantage (Chang, Tsai, & Hsu, 2013). Roberta Pereira et al. (2014) investigated the role of procurement in managing organizational issues that impact on supply chain resilience. Roberta Pereira et al. found that procurement activities have a positive influence on supply chain resilience. The intra- and inter-organizational issues from a procurement perspective affecting supply chain resilience are internal communication, inventory, product flexibility, technology, supplier base, supplier relationships, supply chain design,

transportation, and risk management (Roberta Pereira et al., 2014). Procurement managers need to control and manage both intra- and inter-organizational issues to achieve effective supply chain resilience.

Supply chain flexibility refers to the capability of supply partners to align strategies, restructure operations, and respond to customer demands while maintaining high- performance levels (Tiwari, Tiwari, & Samuel, 2015). Supply chain managers can alter operations to achieve supply chain flexibility (Lee & Rha, 2016). Tiwari et al. (2015) examined the various aspects of supply chain flexibility using a citation analysis method. Tiwari et al. identified four core processes: (a) procurement, (b) sourcing, (c) distribution, and (d) logistics. The most common methods organizational leaders adopt are (a) to enhance flexibility to mitigate risk and uncertainty (b) to increase supplier responsiveness, (c) to maintain a pool of suppliers, (d) postponement, (e) information sharing, and (f) good relationships with supply chain partners (Tiwari et al., 2015). Managers who inculcate in flexibility have to consider many trade-offs such as supply chain efficiency, cost, uncertainty, and controllability.

Supply chain robustness refers to the extent to which a supply chain has an acceptable performance during and after a supply chain disruption (Durach et al., 2015). Robustness is a proactive strategy where supply chain managers implement ex-ante measures to cope with disruptions (Wieland & Wallenburg , 2013). Azadegan, Patel, Zangouezinezhad, and Linderman (2013) stated that a common measure that supply chain managers use to increase supply chain robustness is to incorporate redundancy, for example, the use of reserves. Utilizing a systematic literature review method, Durach et

al. (2015) examined the antecedents of supply chain robustness. Durach et al. identified four antecedents of supply chain robustness: (a) leadership commitment, (b) human capital, (c) relationship magnitude, and (d) risk management orientation. Therefore supply chain managers can assess the extent to which they can increase supply chain robustness, particularly where there are scarce resources.

Collaboration can lead to the development of synergies among supply chain partners through joint planning and exchange of information (Aggarwal & Srivastava, 2016). To investigate how collaborative activities and underlying mechanisms influence supply chain resilience, Scholten and Schilder (2015) conducted a study of eight buyer-relationships in the food processing industry. Scholten and Schilder observed a positive correlation between specific collaborative activities (e.g. joint relationship efforts, mutual knowledge creation, decision making) and supply chain resilience. In a similar study, Scholten et al. (2014) presented an integrated supply chain resilience framework with two components: (a) disruption management processes and (b) supply chain resilience capacity and capabilities. Scholten et al. (2014) observed that the first capabilities that supply chain managers use in developing supply chain resilience are supply chain re-engineering, collaboration, agility, risk awareness, and knowledge management.

Using the Scottish pork supply chain as an example, Leat and Revoredo-Giha (2013) investigated how risk management and collaboration among stakeholders affect supply chain resilience. Leat and Revoredo-Giha observed reduced supply chain vulnerability to risks through a horizontal collaboration of producers and vertical collaboration with processors and retailers. Utilizing regional-level data on disruptions of

the dairy supply chain in Poland, Falkowski (2015) examined supply chain resilience in the agro-food sector focusing on farmer-processor relationships. Falkowski identified three elements that influence the agro-food supply chain's capability to prepare and respond to disruptions: (a) structure of the supplier base, (b) interdependencies between supply chain partners and (c) changes in supply chain governance mechanisms.

Falkowski also observed larger disruptions to supply relations for more fragmented supplier base. Therefore, supply chain managers can focus on their supply chain design structure and procedures to build resilience in their supply chain network.

Many organizational leaders are emphasizing on assessing supply chain resilience to be able to adapt to future and uncertain environments. The overall supply resilience is not necessarily indicative of resilience of individual supply chain tiers, and therefore decision-makers should adopt a system-wide and tier-specific approach in assessing risk resilience (Pournader, Rotaru, Kach, Hossein, & Hajiagha, 2016). Pettit et al. (2013) developed a supply chain resilience model (SCRAM) utilizing a qualitative and quantitative methodology with 1369 respondents from seven global manufacturing supply chains. Pettit et al. identified seven categories of vulnerabilities and 14 managerial controls and organizational capabilities.

Manning and Soon (2016) developed another model with five strategic resilience factors: (a) values-based dynamics, (b) supply chain dynamics, (c) strategic decision-making, (d) strategic leadership, and (e) use of performance indicators as well as a range of indicators for the supply chain monitoring process. The models are useful to food supply chain managers to drive supply chain agility and organizational stability. Supply

chain managers can use the resilience assessment tools to develop strategic resilience management programs and manage risk in a more integrated manner.

Technology and Supply Chains

Information technology (IT) is becoming an indispensable tool in supply chain management. Business managers use IT to improve communication within the organization, lower labor, and production costs, improve the quality of products and services, reduce service time, and increase the firm's competitiveness (Iveroth, 2016). Information technology resources consist of IT infrastructure and IT technical skills and knowledge (Sears & Hoetker, 2014). Leaders in organizations may use web technologies to (a) deliver efficiency in operations, (b) communicate with business partners more easily and frequently, (c) provide efficient electronic payment systems, and (d) improve inventory management and supply chain performance (Tarofder et al., 2013). Also, managers can adopt and use IT to gain sustainability and competitive advantage by exploiting the competitive scope (Luse & Mennecke, 2014).

Supply chain managers can use IT applications to achieve competitive advantage by improving customer service and reducing inventory costs (Sook-Ling, Ismail, & Yee-Yen, 2015). Tripathy, Aich, Chakraborty, and Lee (2016) analyzed the structural relations among information technology (IT), logistic effectiveness, operational efficiency, customer relationship, supplier relationship and competitive advantage. Tripathy et al. found that IT is critical to achieving competitive advantage in supply chain management practices of SMEs in India. Tripathy et al. recommended companies to include up-to-date technology throughout the supply chain and IT- based ordering system to suppliers as

part of their IT strategy. Thus, IT can be a major tool supply chain managers may use to maintain a supply chain's competitive position.

The use of technology in organizations and supply chains has a significant effect on a firm's operational efficiency and effectiveness. Organizational leaders utilize IT to change the way they conduct their business operations and exploit opportunities to improve customer services, market new products, and improve supply chain performance (Tang & Zimmerman, 2013). Magutua, Adudab, and Nyaogac (2015) conducted a quantitative study to establish the relationship between supply chain technology, supply chain strategies, and performance of large-scale manufacturing firms in Kenya. Magutua et al. observed a robust and significant association between supply chain technologies, supply chain strategies, and firm performance. Magutua et al. found that over 88% of the changes in an organization's performance is due to both supply chain technology and supply chain strategies. Utilizing data collected from 197 organizations belonging to various sectors, Sindhuja (2014) examined the effect of information technology security initiatives (ITSI) on supply chain performance. Sindhuja found that ITSI positively relates to supply chain operations and performance. Leaders in organizations should consider using IT for improving supply chain visibility and managing information security.

Technology is constantly changing, and as a result, there are new realities and opportunities. The new technology trends include radio frequency identification (RFID) electronic data interchange (EDI), the cloud, biometrics, vendor managed inventory (VMI), and other internet-based technologies (Caputo, Marzi, & Pellegrini, 2016).

Leaders can use RFID technology to create value within a supply chain by improving supply chain processes (Bowman, 2015). Inventory and demand become more visible within the supply chain, and as a result, supply chain managers may be able to achieve high levels of information sharing and low transaction costs (Asare, Brashear-Alejandro, & Kang, 2016). To investigate the impact of auto-ID technologies on supply chain visibility, Papert, Rimpler, and Pflaum (2016) conducted a qualitative case study of ten actors in the pharmaceutical supply chain. Papert et al. found that use of auto ID-based solutions and in particular RFID leads to supply chain visibility. These technologies are becoming more important than ever before as business leaders are trying to respond to customer needs.

Cloud computing refers to a large-scale distributed, virtualized computing paradigm where managers access resources on demand through web-based technologies (Schniederjans, Ozpolat, & Chen, 2016). Cloud computing has significant advantages for the decentralized and loosely coupled supply chains because supply chain processes become more flexible and visible, through scalability and virtualization (Bruque Camara, Moyano Fuentes, & Maqueira Marin, 2015; Jede & Teuteberg, 2015). Business managers use a virtually infinite number of servers without actually owning them and as such managers can use cloud architecture to address tactical problems relating to IT which include costs, resource availability, process standardization, and reliability (Grubisic, 2014). In comparison to traditional IT, cloud computing has some special features such as elasticity, data concentration, resource sharing, pay-per-use, and low cost (Liu, Yang, Qu, & Liu, 2016). Leaders in organizations may gain agility to respond to changes in the

environment and promote collaboration among supply chain partners by implementing cloud computing.

Lal and Bharadwaj (2016) studied 21 companies to understand the impact of adopting cloud-based services on organizational flexibility. Lal and Bharadwaj observed that cloud-based services which include (a) software-as-a-service (SaaS), (b) platform-as-a-service (PaaS), or (c) infrastructure-as-a-service (IaaS) impacts organizational flexibility and have a relative advantage regarding deployment of services. Given the rapidly changing environment, business leaders would need to adapt to the new technological innovations to achieve process, market, and performance flexibility in their businesses.

Organizational leaders often want to develop new technologies and invest in IT to minimize risk (Tang & Zimmerman, 2013). Business managers who leverage innovative technology in the supply chain can strengthen the supply chain against disruptions (Huang, Wu, Lu, & Lin, 2016). Managers can utilize IT tools to analyze data on risk and minimize supply disruptions by reducing information asymmetries (Murphy, 2014). Supply chain managers can reduce data error within the supply chain by using technologies such as ERP (Bhakoo, Singh, & Chia, 2015). Given the vulnerability of firms to supply chain risks, business managers would need to make better use of IT to minimize risk and improve supply chain performance.

Leaders in organizations are using the internet and related technologies to conduct business across firm boundaries. Business managers are increasingly using e-business applications that involve e-procurement, e-commerce, and e-collaboration to streamline

business processes along the supply chain and overcome business challenges (Wiengarten, Humphreys, McKittrick, & Fynes, 2013). E-business refers to information systems that managers use to acquire, process, and transmit information for effective decision-making (Wiengarten et al., 2013). Business managers use online order processing systems and e-procurement systems to build closer links with customers, suppliers, and third party vendors (Power & Gruner, 2015). Wider and deeper use of e-business applications may be beneficial to supply chain managers in terms of information sharing, incentive alignment, and joint decision making.

Business managers are increasingly adopting e-procurement tools to reduce costs, streamline transactions with suppliers, and minimize expensive face-to-face negotiations (Barahona & Elizondo, 2014). Supply chain managers may be able to respond to changing customer demands quickly and use e-procurement to create value for enterprises (Wiengarten et al., 2013). Managers use e-procurement systems to improve inventory management and control, monitor movement of goods in real time, and increase transparency and efficiency of the supply chain (Barahona & Elizondo, 2014). E-procurement consists of four aspects: (a) e-design, (b) e-sourcing, (c) e-negotiating and (d) e-evaluation (Chang et al., 2013).

To examine the relationship between e-procurement and supply chain performance Chang et al. (2013) analyzed survey data of 108 Taiwanese enterprises. Chang et al. observed that supply chain integration, information sharing, and supply chain partner relationships are critical linkages between e-procurement and supply chain performance. However, compared to partner relationships and information sharing,

supply chain integration had more influence in supply chain performance (Chang et al., 2013). Thus, managers should consider information infrastructure system integration and standardization to achieve supply chain performance.

Effective decision making is critical across all types of businesses in the supply chain. Business managers use decision support systems (DSS) to make management more effective and to be able to respond quickly to changes in the marketplace (Drnevich & Croson, 2013). The major types of DSS are personal decision support systems, group support systems, negotiation support systems, intelligent support systems, knowledge management based systems, data warehousing and enterprise reporting and analysis systems (Hilletofth, Himola, & Wang, 2016). Supply chain managers can use DSS to improve predictability, find improvement alternatives, understand cost structure and delays in supply chains, and use what-if analysis to test the implications of their decisions (Murphy, 2014). Hilletofth et al. developed a decision support model for a multi-level supply chain system that supply managers can use to reduce the cost of inventory and goods sold, and develop a cooperative environment among supply chain members. The DSS is a useful tool that managers can utilize to meet customer demand in a timely fashion.

Supply chain e-collaboration is an important strategic and operational issue because of growing international competition. Collaborative computer-based information systems are now a major trend as business managers seek to reduce uncertainty, achieve competitive advantage and business success (Aggarwal & Srivastava, 2016). Managers use e-collaboration information systems to improve communication abilities in the supply

chain and to respond quickly to changing consumer preferences. Examples of e-collaboration technologies include group decision support systems, Web-based chat tools, collaborative writing instruments, asynchronous conferencing tools, and information sharing tools (e.g. vendor managed inventory(VMI), collaborative forecasting and replenishment (Bhakoo et al., 2015). These tools have scalability and flexibility features that are useful for collaboration among members of the supply chain.

Business managers should consider and assess IT products and services that are most appropriate for their firms and supply chains. Organizational factors that influence the IT adoption process include (a) the company's strategic context, (b) business size in terms of turnover and number of employees, (c) industry type, (d) business maturity, (e) organizational culture and structure, and (d) integration of internal processes (Lonial & Carter, 2015). IT adoption in organizations depends on characteristics of the IT application (e.g., performance, compatibility with existing technological infrastructure) and availability of managerial, technical, and financial resources (Prajogo & McDermott, 2014). The cost of IT products, technological characteristics including security and compatibility are significant determinants of successful IT adoption in businesses (Voss & Brettel, 2014). Information technology security issues, the cost, and compatibility of IT solutions can impact business profitability.

Supply Chain Technology Risks. Information security is an important concern to organizations because it is a key critical resource for any business. Although the use of IT can lead to substantial benefits that include cost savings, business systems inter-linkages and an improvement in supply chain performance, there are also risks associated

with privacy, technical failures, and security (Huong Tran, Childerhouse, & Deakins, 2016). Information security concerns increase when business managers share information across the borders of their firms (Safa et al., 2015). The risks associated with inter-organizational information sharing may be greater when the volume of exchanged data increases (Huong Tran et al., 2016). IT risks include, software attacks, technical failures, threats of data integrity, leakage of information both within the company and across the supply chain, and technological obsolescence(Huong Tran et al., 2016). Other IT risks include unethical IT use and related activities such as hacking, software piracy, phishing, and spoofing(Chatterjee, Sarker, & Valacich, 2015).

IT risks have an impact on business performance. The cost and consequences of IT risks could be severe regarding the damages due to production downturns, disruption of internal processes and communication, loss of potential sales, and wastage of time (Sindhuja, 2014; Sindhuja & Kunnathur, 2015). Use of supply technologies such as vendor managed inventory and EDI can lead to increased visibility of the information within the supply chain (Caldwell, Harland, Powell, & Zheng, 2013). Therefore, if interorganizational systems are not adequately security protected, a security breach may lead to reduced trust among supply chain partners and consequently impact negatively on the competitiveness of the supply chain.

IT risks have a direct bearing on business risks. IT risks can lead to loss of profit, market share, and credibility (Huong Tran et al., 2016). Cyber attacks can result in loss of information and data loss by a service provider can lead to service discontinuity and loss of business (Sung & Su, 2013). Technological obsolescence or technological

underperformance can lead result in loss of market to a competitor who can supply high-quality products (Huang et al., 2016). Intangible risks such as loss of valuable data, loss of consumer trust or business reputation can affect the survival of a company (Huong Tran et al., 2016). Organizations also become more vulnerable to increased use of social media as they become more porous to outsiders (Arlitscha & Edelmanb, 2014).

Companies can face huge financial losses due to technological risks. Software piracy may cost businesses an estimated \$12 billion in a year (Kuhn, Ahuja, & Mueller, 2013). A data breach at TJX resulted in an estimated financial loss of \$0.5 to \$1.5 billion and affected 45 to 100 million customers (Goldberg, 2013). In the United Kingdom, SMEs incurred about £311, 00 in 2015 as a result of security breaches (Department for Business, Innovation & Skills, 2015). Given the high costs of IT security threats, organizational leaders need to implement strategies to prevent and mitigate the IT risks.

Managers can mitigate IT security risks more effectively by developing IT risk management strategies. Huong Tran et al. (2016) identified six management strategies for reducing IT risks in supply chains: (a) frequent communication with supply chain partners, (b) open and honest transactions, (c) right partner selection, (d) good personal relationships with trading partners, (e) formal contracts for sharing sensitive data, and (f) collaboration among supply chain partners. Leaders in organizations need to create awareness among their employees about IT security issues and protecting IT assets (Mishra, Caputo, Leone, Kohun, & Draus, 2014). Other strategies include an organizational culture of security awareness and effective communication about IT security vulnerabilities by educating and training employees (Safa et al., 2015). IT

security audits and monitoring may lead to compliance and a reduction of IT security internal threats (D'Arcy & Greene, 2014). Business leaders may need new skills to minimize IT security vulnerabilities and the associated effects.

Supply Chain Risk Management

Risk management is one of the most important issues in supply chain management and a priority activity for supply chain managers. Supply chain risk management is essential to supply chain operations due to natural catastrophes and risks associated with process uncertainties (Mohammaddust, Rezapour, Farahani, Mofidfar, & Hill, 2015). Managers cannot operate in a risk-free environment. Supply chains are inherently risky and organizational leaders cannot avoid all supply chain disruptions (Pournader et al., 2016). Kaki et al. (2015) examined disruptions in supply networks and found out that most risks in the supply chain can affect business continuity. To sustain a business, business managers must assess the risks related to the organization, develop contingency plans to mitigate the effects of disruptions and ensure business continuity (Cagnin et al., 2016). In many companies, supply chain risk managers focus on developing new proactive approaches to manage supply chain disruptions and to build supply chain resilience (Ghadge, Dani, Chester, & Kalawsky, 2013). Supply chain managers can design an efficient supply chain network if they understand the causes of supply chain disruptions and the severity of their impact.

Supply chain risk management involves assessing risk sources and the impact of risk, tracking risk drivers, and mitigating risks in the supply chain (Pradhan & Routroy, 2014). Supply chain risk management is a proactive approach supply chain managers use

to identify and manage all possible risks facing a company (Cagnin et al., 2016). Other important aspects of supply chain risk management include risk monitoring and contingency planning (Kumar & Bhat, 2014). Business managers are adopting and intensifying the use of enterprise risk management practices to detect and mitigate strategic and operational risks (Boyson, 2014). With globalization and vertical integration of business processes, leaders in organizations should deal proactively with potential supply chain risks.

The two most important risk sources in supply chains are operational risks and disruption risks (Konig & Spinler, 2016). Operational risks within the supply chain include process, control, supply, and demand risks (Parihar & Rahul, 2014). Disruption risks arise from human-made disasters (e.g. terrorist attacks, labor strikes) and natural disasters (e.g., earthquakes, fire), and as such, they are more difficult to predict than operational risks (Konig & Spinler, 2016). Such risks affect supply chain operations and performance measures, for example, cost and responsiveness.

Business managers need to identify, understand, and manage risks to achieve competitive advantage. Utilizing a mixed methods approach, Gualandris and Kalchschmidt (2015) observed a direct positive relationship between supply chain risk management practices and competitive advantage. Gualandris and Kalchschmidt found out that a firm's competitive advantage decreases when its preparedness in supply chain risk management does not match environmental conditions. Elahi (2013) noted a direct relationship between risk management and competitive advantage. Elahi(2013) argued that risk management capabilities affect the company's cost and the creation of value to

customers. The efficient management of supply chain risk can lead to an improvement in business and overall supply chain performance (Simangunsong, Hendry, & Stevenson, 2016). Managers who adopt supply chain practices may be able to improve efficiency and customer satisfaction by reducing the probability and severity of supply chain risk.

Supply chain uncertainty and risk are impediments to operational excellence (Wang, Jie, & Abareshi, 2015). Managers can mitigate risks more effectively by analyzing the likelihood, magnitude, and impact of disruptions along the supply chain (Kaki et al., 2015). To investigate the relationship between uncertainty and disruption risk, Tse et al. (2016) conducted a quantitative survey of 253 senior managers and directors in the Thai beverage industry. Tse et al. found that demand and product quality uncertainty negatively relate to the severity of disruption risk. Supply chain managers may target their risk management strategies according to both magnitude and probability of supply chain risk.

Evaluating risk is a critical step in the risk management process, and organizational leaders should follow the five generic steps to mitigate risks: (a) risk identification, (b) risk assessment, (c) development of risk mitigation plans, (d) implementation of supply chain risk strategies, and (e) continuous monitoring (Kumar & Bhat, 2014). For effective risk management, Elahi (2013) noted five risk management capabilities that are critical in organizations: (a) cultivating a risk awareness culture, (b) identifying potential risks, (c) assessing the impact of risks, (d) preventing and mitigating the impact of risks, and (e) the ability to quickly recover from realized risk. Leaders in organizations should not mainly focus on eliminating risk, but they should be more risk

informed and should use supply chain risk management as a tool to generate value (Trkman, Valadares de Oliveira, & McCormack, 2016). Therefore, supply chain managers should consider risk management as an investment and not as a cost and use it to create new value for the organization.

Although managing supply chain risks directly affect financial performance, investment by companies in supply chain risk management is still small (Rotaru, Wilkin, & Ceglowski, 2014; Trkman et al., 2016). Fischl, Scherrer-Rathje, and Friedli (2014) examined the use of risk management tools in organizations and found that many organizational leaders use informal methods as opposed to formal methods in managing risk in supply chains. Kumar et al. (2014) cited supply chain complexity and the uncertainty associated with supply chain risks as key factors contributing to the difficulties supply chain managers face in correctly identifying the sources of risk. For high likelihood disruptions, Kumar et al. recommended supplier audits, postponement, strategic safety stock, and supplier hedging. Mitigation strategies for moderate to high supply chain disruptions may include multi-sourcing, make-and-buy approach, price and promotion planning, and assortment planning (Kumar et al., 2014). Organizational leaders should consider the severity of the risk they face and how much they would be willing to invest in supply chain risk management to mitigate the risk.

Managers consider the potential supply chain risk in selecting the appropriate mitigation strategies (Punniyamoorthy, Thamaraiselvan, & Manikandan, 2013). Drawing upon the contingency theory, Chang et al. (2015) examined redundancy and flexibility risk mitigation strategies with particular risk contexts and found that in high severity

disasters, holding safety stocks and maintaining options with multiple suppliers are expensive options. In such situations, Chang et al. recommended managers to buy insurance because such disruptions can affect business continuity. In contrast, supply chain managers should use a flexible risk mitigation strategy to alleviate the impact of supply chain disruptions that are less severe, and for severe disruptions and high probability contexts, they should consider using a combination of redundancy and flexible mitigation strategies (Chang et al., 2015). Thus, supply chain risk managers can select prevention and mitigation strategies based on the level of uncertainty and risk.

Rajesh, Ravi, and Rao (2015) conducted a quantitative study, utilizing a combination of grey theory and digraph-matrix methodology to identify and quantify supply chain risk mitigation strategies. Rajesh et al. found that the most five effective mitigation strategies in reducing total risk impacts of the supply chain are (a) using insurance, (b) reducing bullwhips, (c) increasing agility and resilience, (d) increasing collaboration, and (e) revenue management. To investigate the different supply chain risk management strategies managers of automobile firms use for mitigating supply chain risks, Kumar and Bhat (2014) analyzed survey data of 79 Indian automobile firms. Kumar and Bhat identified seven strategies: (a) avoidance, (b) supplier development, (c) flexibility, (d) risk-pooling, (e) redundancy, and (f) integration and control.

Talluri et al. (2013) utilized an empirically grounded simulation methodology and non-parametric statistical methods to analyze and rank mitigation strategies. Talluri et al. identified seven risk strategies: (a) increasing capability, (b) aggregating demand, (c) increasing capacity, (d) acquiring redundant suppliers, (e) increasing inventory, and (f)

increasing responsiveness. Talluri et al. found that the more efficient strategies across all risk types lead to an increase in supply chain responsiveness and aggregate demand. Therefore, managers should develop prevention and mitigation strategies that match specific risk contexts and prevent and mitigate supply chain risks from both an effectiveness and resource allocation standpoint. Supply chain managers would need information on the relationships between risks and mitigation strategies to build strategic transitions into their planning and supply chain designs.

Transition

This study was on strategies agribusiness managers use to prevent and mitigate the effects of disruptions in agro-food supply chains. In Section 1, I described the foundation and background of the study. The key elements in this section included the background of the problem, problem and purpose statements, nature of the study, research and interview questions. Other aspects included (a) conceptual framework, (b) operational definitions, (c) assumptions, limitations, and delimitations, (d) significance of the study, and (e) review of the academic and professional literature. In Section 2, I discussed the research method and design, my role as the researcher, participants, population and sampling techniques, ethical research issues, data collection and analysis, and reliability and validity. In Section 3, I presented the study findings, discuss the results and implications for social change, and provide recommendations for action and future research studies.

Section 2: The Project

Section 2 of this study contains (a) the purpose statement, (b) the role of the researcher, (c) research participants, (d) research method and design, (e) population and sampling, and (f) ethical research. In this section, I also described the data collection process, data analysis techniques, and the validity and reliability of the study findings. In Section 3, I discussed the study findings, the applicability of the study results with respect to professional practice, implications for social change, recommendations for action, and reflections.

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies agribusiness managers use to prevent and mitigate the effects of disruptions in the agro-food supply chains. The population of the study consisted of five agribusiness managers from two agro-food companies in the urban district of Harare, Zimbabwe. The agribusiness managers had implemented successful strategies for preventing and mitigating the effects of disruptions in agro-food supply chains. The implications for positive social change may include a reduction in supply chain costs, provision of better services and products to consumers, and lower prices of agro-food products to consumers which consequently can lead to an improvement in the lives of consumers.

Role of the Researcher

Qualitative researchers focus on collecting data on participants' perceived and lived experiences to gain a detailed understanding of the phenomenon under study (Morse, Lowery, & Steury, 2014). In qualitative research, researchers are the primary

instruments for data collection and must avoid bias during the research (Ercikan & Roth, 2014). As the researcher in this study, I served as the principal data collector. The role of the researcher is to collect and assemble data accurately, analyze the data, and present the results in an objective format (Delyser & Sui, 2014). I selected the appropriate research design, recruited study participants, conducted interviews, analyzed data, and managed the interview process to gain participants' trust.

In qualitative studies, researchers have the responsibility to disclose their experiences, values, assumptions, and any biases they may have on the research topic, participants, or location (Marshall & Rossman, 2016). I have knowledge of the operations of agro-food companies and their supply chains after working with both private and public enterprises in the agro-food sector for 20 years. However, I had no relationship with the participants. Researchers adhere to the ethical standards and guidelines for the protection of research participants in accordance with the Belmont Report (U.S. Department of Health and Human Services, 1979). Before conducting the study, I completed the web-based National Institutes of Health (NIH) training course (Certification Number 1850113; Appendix A). I adhered to the principles and technical guidelines for the protection of human subjects and ensured confidentiality protections of research participants.

Researchers' preconceptions or personal bias can influence the direction or results of a research study (Yin, 2014). Bernard (2013) noted that researchers need to remain unbiased and nonjudgmental throughout the research process. Qualitative researchers employ the bracketing method to separate their perceptions, personal experiences, and

beliefs from the research data (Sorsa, Kiikkala, & Astedt-Kurki, 2015). I avoided bias by being neutral and objective during data collection, maintained a reflective journal to bracket my experiences regarding the phenomenon under study, and verified data through member checking.

Qualitative researchers use interview protocols to minimize inconsistencies in the research interview process (Morton, Rivers, Charters, & Spinks, 2013). An interview protocol is a step-by-step instruction guide researchers utilize to collect data to address the research question (Yin, 2014). I followed the interview protocol and treated each participant the same way during interviews. I obtained IRB approval and gained local permission before data collection. To ensure privacy and confidentiality, the names of companies and participants should remain anonymous (Newington & Metcalfe, 2014). To protect participants' identity, I used alphanumeric codes (P1, P2, P3, P4, and P5) for the five participants. I stored all the collected data in a security-monitored location. After 5 years, I will shred the printed information and delete the electronic material.

Participants

In a qualitative case study inquiry, researchers select participants before collecting the data (Yin, 2014). The fundamental principle in choosing participants is not about the number of individuals or views, but the range of opinions on a topic (O'Reilly & Parker, 2013). I used purposeful sampling to select five agribusiness managers for the study. Researchers use a purposive sampling approach to recruit participants with relevant experience, knowledge, and insight to the research question (McCabe, Stern, & Dacko, 2013; Palinkas et al., 2015). Additionally, researchers purposefully select participants

based on the study criteria (Hayes, Bonner, & Douglas, 2013). It is essential for researchers to choose participants based on the set criteria and on what would give them the best results (Leedy & Ormrod, 2013). The eligibility requirements for study participants included (a) serving as a senior agribusiness manager, (b) ability to provide rich information on agro-food supply chain disruptions, and (c) experience in implementing successful strategies for preventing and mitigating the effects of disruptions in agro-food supply chains.

Researchers can gain access to participants through personal contacts or business networking (Barker, 2013; Beskow, Check, & Ammarell, 2014). Thurnell-Read (2016) described two types of access: (a) formal access to the organization and participants, and (b) personal access where the researcher gets to know executives, managers, and individuals. To gain access to individuals, researchers must develop a reputation for consistency and integrity (Newington & Metcalfe, 2014). Over the past 20 years, I have carried out assignments as an independent consultant for both private and public agro-food companies and established rapport with the company executives. I sought permission to conduct the study from the managing directors of the two agro-food companies. After gaining permission from the leadership of the two organizations (Appendix B), I contacted the participants by e-mail inviting them to participate in the study.

A qualitative researcher must establish a working relationship with participants for a successful research project (Anyan, 2013; Yin, 2014). Communication, trust, and mutual respect are critical elements of a good working relationship (Johnson, 2014).

Researchers should establish open communication with participants to build confidence and trust (Gibson, Benson, & Brand, 2013). I selected five participants from two agro-food companies in Harare and sent them an invitation letter (Appendix C) that included a description of the study objectives and intent, selection criteria, and a copy of the consent form. The consent form contained details on the voluntary nature of the study, research-related risks and benefits, and the extent of confidential protections for participants. I disclosed the risks and benefits of being in the study to the participants and ensured each participant completed the consent form before conducting the interviews. I built trust by reassuring each participant the confidentiality pertaining to the study.

Research Method and Design

Research Method

The appropriate research method for this study was qualitative. Qualitative research involves gaining a detailed understanding and in-depth knowledge of meanings, reasons, and patterns of individuals' lived experiences (Garcia & Gluesing, 2013; Nelson & Evans, 2014). Qualitative researchers focus on events in natural settings, observe behavior and attitudes, and collect the data close to the phenomenon (Guercini, 2014; Marshall & Rossman, 2016). In a qualitative inquiry, researchers explore the problem from the perspective of the study population and focus on identifying, exploring, and describing variables that are difficult to measure or quantify mathematically (Bevan, 2014; Singh, 2014). My use of qualitative research was appropriate to explore and gain an understanding of how agribusiness managers prevent and mitigate the effects of disruptions in agro-food supply chains.

Quantitative research refers to an empirical investigation of an observable phenomenon through numerical data collection and statistical analysis (Goertz & Mahoney, 2013). Researchers use quantitative research to test hypotheses, examine variables, and analyze statistical data (McCusker & Gunaydin, 2015). However, researchers cannot use quantitative methods to articulate personal experiences (Frels & Onwuegbuzie, 2013). A quantitative method was not appropriate because I was not seeking to test hypotheses, to examine variables, or compare variables' effects but to explore strategies for preventing and mitigating the effects of agro-food supply chain disruptions.

The mixed methods approach involves combining statistical analyses of numerical data and thematic data (Caruth, 2013; Golicic & Davis, 2012). In a mixed methods approach, researchers combine empirical data and participant experiences in the same research inquiry (Sparkes, 2014). A mixed method approach can be time consuming because researchers must deal with collecting and analyzing a variety of data (Hayes et al., 2013). A mixed methods approach was not suitable for this study, as this research did not require the integration of qualitative and quantitative techniques for data collection and analysis. The purpose of this study was to explore strategies agribusiness managers use to prevent and mitigate the effects of disruptions in the agro-food supply chains, which made the qualitative method the most appropriate research method for the study.

Research Design

I considered four qualitative designs for the proposed study: (a) ethnography, narrative, (b) case study, and (c) phenomenological study. I selected a qualitative

multiple case study design for this study. Researchers use the case study design for in-depth inquiry, and it is an appropriate design where a researcher seeks to answer *how*, *why*, and *what* questions (Parker, 2014; Yin, 2014). A case study research design is appropriate for understanding emerging ideas, real-life events, and situations that do not have a single set of outcomes (Dasgupta, 2015; Starr, 2014). A multiple case study involves comparison of different cases, and the evidence is more compelling and robust compared with a single case study (Yin, 2014). The qualitative multiple case study design was the most appropriate research design for this study because my goal was to identify and explore the strategies that agribusiness supply chain managers used in preventing and mitigating the effects of agro-food supply chain disruptions.

Researchers use a narrative inquiry to get insights into people's thoughts, emotions, and interpretations (Scutt & Hobson, 2013). Narrative researchers focus on collecting data on participants' life experiences in a sequential manner (Singh, Corner, & Pavlovich, 2015), which was not the intent of this study. Narrative researchers' interests are more in the meaning of the stories rather than the facts or truth of the accounts (Green, 2013). The purpose of the study was to understand and describe strategies for preventing and mitigating the effects of agro-food supply chain disruptions and not to document stories about the lives of agribusiness managers.

Researchers use the phenomenological approach to understand the character and meaning of participants' lived experiences to a particular event from individual perspectives (Budd & Velasquez, 2014; Khan, 2014). In a phenomenological inquiry, researchers examine in-depth the event experience (Ziakas & Boukas, 2014).

Phenomenological researchers explore the essence of participants' lived experiences through individual stories, interviews, or observations (Budd & Velasquez, 2014). The phenomenological design was not suitable because the basis of this study was not on subjective individual viewpoints and interpretations of the lived experiences with the phenomenon.

Researchers use an ethnographic inquiry to explore cultural characteristics and patterns of selected groups (Zilber, 2014). The ethnographic research design involves studying shared beliefs of a group over time (Bamkin et al., 2016; Baskerville & Myers, 2014) and was therefore also not appropriate for this study. The objective of this study was not to describe unique shared cultural patterns of agribusiness managers but to explore successful strategies for preventing and mitigating the effects of agro-food supply chain disruptions. By using a multiple qualitative case study, my intention was to provide useful insights on strategies to reduce disruptions in agro-food supply chains, as well as raise agribusiness managers' awareness and understanding of strategies for preventing and mitigating the effects of disruptions in agro-food supply chains.

In qualitative research, researchers gather enough data to support the validity of the study (Emerson, 2015). Researchers use data saturation as a tool to ensure collection of quality and adequate data (Morse, 2015). Data saturation is the point in the data collection process where there is no additional new information from interviews (Fusch & Ness, 2015). Because data saturation is an important component of rigor (Morse, 2015), I continued to interview until no new information and no new themes emerged. I reached data saturation after five interviews.

Population and Sampling

The population of this study comprised of five agribusiness managers from two agro-food companies in the urban district of Harare, Zimbabwe. I used purposive sampling to identify and select participants with the requisite knowledge and experience in preventing and mitigating the effects of disruptions in agro-food supply chains. Researchers utilize a purposive sampling approach to recruiting participants with relevant experience and expertise regarding the subject matter under study (McCabe et al., 2013; Sangestani & Khatiban, 2013). Purposive sampling is a nonprobabilistic sampling technique which is suitable for case study research (Ishak & Bakar, 2014). Purposive sampling is a popular choice for most qualitative researchers because it is time saving, less costly, and researchers can create rich descriptions of the phenomenon (Palinkas et al., 2015; Smith, Colombi, & Wirthlin, 2013).

Qualitative researchers determine sample sizes before conducting the study, and the sample size is a constant target throughout the study (Guetterman, 2015). A small sample is desirable in a qualitative study, but it should be sufficient to meet data saturation standards (Hyat, 2013; Stake, 2013). A qualitative case study can have as few as five participants (Dworkin, 2012). Boddy (2016) revealed that in a constructivist approach to research, a case study could even have a single participant. In this study, I interviewed five agribusiness managers with knowledge and experience in implementing successful strategies for preventing and mitigating the effects of disruptions in agro-food supply chains.

Data saturation is a significant issue in qualitative research because it is a tool researchers utilize to demonstrate rigor (Emerson, 2015; Morse, 2015). Researchers use data saturation to ensure collection of quality and adequate data (Marshall, Cardon, Fontenot, & Poddar, 2013). A researcher reaches data saturation when no additional new information or themes emerge with more interviews (Fusch & Ness, 2015; Houghton, Casey, Shaw, & Murphy, 2013). To ensure data saturation, I interviewed participants until no additional themes or new coding emerged with more interviews. I reached data saturation after five interviews.

Researchers purposefully select participants based on the study criteria (Gile, Johnston, & Salganik, 2015; Suri, 2013). It is essential for researchers to choose participants based on the set criteria and on what would give them the best results (Leedy & Ormrod, 2013). Participants must have the requisite knowledge and competency to answer questions (McCabe et al., 2013). I interviewed agribusiness managers who met a pre-established criterion based on their experience and competence to answer the interview questions. The eligibility requirements for study participants included (a) serving as a senior agribusiness manager, (b) ability to provide rich information on agro-food supply chain disruptions, and (c) experience in implementing successful strategies for preventing and mitigating the effects of disruptions in agro-food supply chains.

In qualitative research, researchers must select interviewing sites that are comfortable, quiet, and free from distractions to allow participants to share their information freely (Fusch & Ness, 2015; Qu & Dumay, 2012). Marshall and Rossman (2016) noted that the comfort level of interviewees can influence how they respond

during the interview. Interviewing sites must also be accessible and convenient to interviewees (Qu & Dumay, 2012). I selected a site that was convenient to participants and conducted face-to-face interviews in a comfortable and quiet place. Choosing a quiet place was also essential for quality recordings. To avoid distractions during the interview, I requested participants to put their cell phones in silent mode.

Ethical Research

Protection of human subjects is an essential element of ethical research, and the researcher has the responsibility of protecting the rights and confidentiality of research participants (Nah, Bennett, Ingleton, & Savage, 2013). The protection of human subjects includes protection from physical or psychological harm as well as the commitment to support and value the dignity of research participants (Largent, 2016). In qualitative research, ethical integrity is essential for study credibility (Haahr, Norlyk, & Hall, 2013). I maintained high ethical standards throughout the study and complied with the Walden University research and integrity policies.

After getting the Walden University IRB approval (approval number 07-10-17-0473618), I e-mailed participants consent forms well before the interview date to afford them the opportunity to make an informed decision. The consent form contained (a) background information on the research topic and purpose of the study (b) research procedures, (c) the voluntary nature of the study, (d) risks and benefits of being in the study, and (e) confidentiality and safety procedures. The four principles of informed consent include freedom, voluntariness, justice, and nonmaleficence (Rodrigues, Antony, Krishnamurthy, Shet, & De Costa, 2013). I adhered to the principles and explained to the

participants the purpose of the study, the research risks and benefits, and the extent of confidentiality protections for research participants.

I ensured that each participant signed the consent form before the beginning of the interview. Each of the five agribusiness managers consented to be in the study.

Participants had the right to withdraw prior the interview by either written or verbal notice. Additionally, participants did not have to respond to specific questions if they felt uncomfortable in doing so. I conducted face-to-face interviews and audio-recorded the interviews after obtaining approval from each participant.

To avoid undue influence on research results, some researchers may not offer incentives to research participants (Sikweyiya & Jewkes, 2013). I did not provide any incentive to study participants, but the participants will receive a copy of the findings and conclusions of the study. The protection of participants and their associated organizations was paramount. To ensure privacy and confidentiality, the names of companies and participants should remain anonymous (Newington & Metcalfe, 2014; Zhou & Nunes, 2013). I did not include the names of participants and the associated organizations anywhere in the study but assigned identification numbers and letters. I assigned for example, P1C1_120717_1000AM, to identify the participant, the company, date of the interview, and time of the interview. I stored data collected during the research on a computer that is password protected. I locked all non-digital material which included consent forms, my reflective journal, and a research log in a fire proof safe that I only can access. After 5 years, I will shred the hard copies and delete the electronic material.

Data Collection Instruments

Data collection involves direct interaction with individuals and building trust with participants through open-ended discussions (Myers, 2015). In qualitative research, researchers are the primary instruments for data collection and must avoid bias during the research (Cleary, Horsfall, & Hayter, 2014; Robinson, 2014). Researchers must collect accurate data from appropriate sources (Ercikan & Roth, 2014). I served as the principal data collection instrument, and I used an audio recorder to capture participants' responses. Another source of data in this study was company documents. Yin (2014) noted that documentary information is relevant to every case study topic. Researchers should spend more time reviewing documents that are central to the research inquiry (Marshall & Rossman, 2016). Qualitative researchers use information from documents to corroborate and augment evidence from other sources (Heale & Forbes, 2013; Yin, 2014).

Qualitative researchers use semistructured interviews to explore and understand participants' lived experiences and realities (Doody & Noonan, 2013). Nyamah et al. (2014) used semistructured interviews to determine the supply chain risks in Ghana's agricultural supply chain and the ability of supply chain partners to control the risks. Similarly, Macdonald and Corsi (2013) used semistructured interviews to determine the internal and external factors that influence the overall disruption management process in supply chains. Semi-structured interviews are valid data collection instruments and are a useful way researchers collect insights on the research topic (Yin, 2014). I used semistructured interviews to explore the strategies agribusiness managers used to prevent and mitigate the effects of disruptions in the agro-food supply chains. I also asked each

participant for company documents and records pertaining to strategies for managing disruptions. Secondary data for this study included documents on company policy and operational procedures for managing disruptions, risk management plans, minutes, and business continuity plans.

Semistructured interviews are in-depth interviews based on an interview guide or protocol, where respondents answer preset questions (Robinson, 2014). Researchers use semistructured questions to draw rich and thick descriptions from participants (De Massis & Kotlar, 2014; Jamshed, 2014). An interview protocol is a procedural guide with a list of questions that researchers explore in the course of an interview (Platt & Skowron, 2013). Qualitative researchers use a study protocol to maintain the focus of the inquiry (Marshall & Rossman, 2016). According to Yin (2014), an interview protocol for a qualitative research case study consists of (a) an overview of the research study, (b) procedures for data collection, and (c) interview questions.

I followed the interview protocol (Appendix D) and used semi-structured questions to collect direct evidence from participants. I read out the questions and probed further with follow-up questions to get more detailed explanations and personal views of participants. I listened carefully to participants' responses. As recommended by Yin (2014), I also observed body language and gestures to get insights of attitudes and meanings.

Qualitative researchers use member checking to verify the accuracy and confirm the correct interpretation of the data (Koelsch, 2013; Reilly, 2013; Yin, 2014). Member checking is an essential quality control process where study participants can review data

or results for accuracy and validity (Reilly, 2013). Researchers verify interview information with respondents to enhance quality and credibility of data and also establish construct validity (Yin, 2014). I conducted transcript review and member checking to improve quality and optimize credibility and validity in data collection. I prepared transcripts from the recorded interview data and asked each to review their transcript document to verify the correctness of the data. After coding and analyzing the data and the company documents, I asked the participants to review a summary of my interpretation of their responses to the interview questions and my analysis of the company documents. I incorporated the feedback from each participant before I evaluated the results and developed conclusions relevant to the research question.

Data Collection Technique

The research question for this study was: What strategies do agribusiness managers use to prevent and mitigate the effects of disruptions in agro-food supply chains? The data collection techniques I used for this study were semistructured interviews and document analysis. I conducted face-to-face interviews using the interview protocol (Appendix D). Researchers utilize semistructured interview formats to explore and gain an understanding of lived experiences because participants can express their opinions and experiences fully (Brooks & Normore, 2015; Houghton et al., 2013). The semistructured interview is a technique researchers use to capture participants' experiences, opinions, and attitudes about a specific phenomenon (De Massis & Kotlar, 2014). In semistructured interviews, researchers give direction and structure to the dialogue while allowing a free and open discussion to develop (Yin, 2014).

Semistructured interviews are direct, insightful, and highly efficient means by which researchers collect rich, empirical data when the phenomenon of interest has no single set of outcome (De Massis & Kotlar, 2014). By using semistructured interviews, researchers can have a fuller discussion of topics and can uncover participants' hidden attitudes and emotions (Mojtahed, Nunes, Martins, & Peng, 2014). Additionally, researchers can compare responses by asking the same questions to each participant (Bredart, Marrel, Abetz-Webb, Lasch, & Acquadro, 2014). Weaknesses of semistructured interviews include (a) bias due to poorly articulated questions, (b) researcher interpretation bias, and (c) interviewees may suffer from memory failure or inaccurate recall of past events (De Massis & Kotlar, 2014). Also, Yin (2014) noted the risk of asking leading questions in semi-structured interviews. However, to limit bias in data collection, researchers use different and well-informed sources who view the phenomenon under study from various perspectives (De Massis & Kotlar, 2014).

After obtaining Walden University IRB approval, I sent an introductory letter to eligible participants that included a description of the study objectives and intent, selection criteria, benefits of the study, and a copy of the consent form. I then scheduled the date and time for a face-to-face interview for each participant. I recorded the interview using iPhone 7 plus recorder and took notes using a smart pen and a notebook. The interview session lasted between 30-45 minutes. In qualitative studies, it is critical to maintaining accurate findings and consistent documentation of the steps of the procedures taken (Yin, 2014). Qualitative researchers document accurate details of the face-to-face interviews (Anderson, Bolton, Fleming, & Lord, 2016; Snook & Oliver,

2015). By taking notes during the interview, researchers can be able to keep track of the non-auditory data such as body and facial reactions (Houghton et al., 2013). I took notes and observed participants' nonverbal language and gestures. By conducting face to face structured interviews, I was able to gather quotes and rich descriptions of the phenomenon under study.

Member checking is an important quality control process where researchers verify interview information with respondents to enhance quality and credibility of data (Harvey, 2015; Yin, 2014). Researchers use member checking to verify the correctness of the data (Reilly, 2013). By incorporating member checking, researchers increase the credibility and trustworthiness of the data (Chronister, Marsiglio, Linville, & Lantrip, 2014). I conducted member checking to verify the accuracy and correct interpretation of the participants' responses. I incorporated the feedback received from each participant to increase the trustworthiness of the data.

Data Organization Techniques

The researcher is responsible for implementing an appropriate data organization system to support data retrieval and analysis, and enhance credibility (Derobertmeasure & Robertson, 2014; Schermann et al., 2014). Data organization involves classifying and assigning file names for stored research data with identifiable content related references (Almutairi, Gardner, & McCarthy, 2014; Wickham, 2014). In qualitative research, researchers use research logs to keep track of all research activities and to capture key ideas presented by participants during interviews (Clancy, 2013; Glaser & Laudel, 2013). Researchers also use research logs to record and update key

information during the research process (Layder, 2013). I used a research log to keep track of all research activities and to record and update key information collected from each participant on preventing and mitigating disruptions in agro-food supply chains. To maintain confidentiality and privacy, I used alphanumeric codes for each participant. I used a naming convention P1CI_120717_1000AM, to identify the participant, the company, date of the interview, and time of the interview.

Labeling and organizing data according to content are essential components of qualitative research (Bernard, 2013). Researchers organize data into categories to identify emerging themes, trends, and patterns from interviews (Anyan, 2013; Fielding, Fielding, & Hughes, 2013). I uploaded the interview transcripts into NVivo 10 software, sorted, categorized, and labeled all the research data for the study. I organized the raw data into themes based on the collected interview data as well as the literature review and conceptual framework. To ensure security and confidentiality of the research data, I am the only person who has access to the study data. The data will remain in storage in a security-monitored location for 5 years. After 5 years, I will shred copies of the printed information and delete the electronic material.

Data Analysis

Qualitative data analysis involves a systematic review of data elements and interpreting the underlying meanings from the participants' experience (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014). Qualitative researchers analyze textual data to discover essential meanings, patterns, and themes of the phenomenon under study (Bryman, 2015). In a qualitative case study, researchers use data from different sources to

corroborate the research findings and ensure validity (Beckert & Ghisi, 2015; Carter et al., 2014). A researcher may use any of the four types of triangulation; (a) data triangulation, (b) investigator triangulation, (c) theory triangulation, and (d) methodological triangulation (Heale & Forbes, 2013; Yin, 2014). With methodological triangulation, researchers use multiple sources of data such as observations, interviews, documents, and questionnaires in analyzing various aspects of the phenomenon under study (Manganelli et al., 2014; Yilmaz, 2013). I used methodological triangulation for this study. With the CTF as the guiding conceptual framework, I reviewed company documents and analyzed data from the texts of semistructured interview transcripts to explore the strategies for preventing and mitigating disruptions in agro-food supply chains. By employing methodological triangulation, I was able to get a complete understanding of the phenomenon under study and also validate the research findings.

Sousa and Figueiredo (2014) identified five main steps of data analysis; (a) cleaning and organizing the data, (b) coding the data, (c) identifying emerging patterns and themes, (d) interpreting the data, (e) evaluating results and developing conclusions. After cleaning and organizing the data, coding is one of the most important steps in data analysis (Bernard, 2013). Coding is the process of categorizing collected data related to each other into nodes (Campbell, Quincy, Osserman, & Pedersen, 2013; Zamawe, 2015). Qualitative researchers use coding to facilitate the identification of core concepts or themes prominent across all collected data (Marshall & Rossman, 2016). I cleaned the data and employed coding as the primary data analysis technique to identify patterns and key themes and draw meaning from all data gathered in this study.

Researchers may use computer-assisted qualitative data analysis software (CAQDAS) for data organization and analysis (Bryman, 2015; Talanquer, 2014). Castelberry (2014) described NVivo 10 software program as a qualitative data analysis tool researchers can use to analyze varied types of data such as interview transcripts, documents, field notes, press clippings, images, and photographs. By using NVivo 10 software, qualitative researchers can (a) reduce most manual tasks, (b) handle large data sets, (c) analyze themes, and (d) evaluate results and draw conclusions (Basak, 2015; AlYahmady & Alabri, 2013). I used NVivo 10 software to sort, code and analyze data. I transcribed the audio recording of the interviews into Microsoft Word transcripts, loaded the transcripts into NVivo 10 software, and then analyzed the data to identify emerging themes. I compared the emerging themes with information derived from the literature review phase of my study, the conceptual framework, and new studies published after writing the doctoral study proposal. I used the CTF to help me interpret the data and draw conclusions.

Reliability and Validity

Qualitative researchers must seek to establish high quality and well-designed research (Bernard, 2013). Quality refers to completeness, accuracy, and timeliness (Chen, Hailey, Wang, & Yu, 2014). The two main tests that form the basis from which to establish the quality of research are reliability and validity (Leedy & Ormrod, 2013). Reliability and validity refer to the accuracy and precision of the research (Foley & O'Connor, 2013). Reliability is the extent to which the researcher can show objectivity and replicability of collected data and obtain consistent results (Ma, Lund, Nielsen,

Aamand, & Su, 2015). Validity refers to the qualities of credibility, trustworthiness, authenticity, and transferability (Cope, 2014; Leedy & Ormrod, 2013).

Reliability

Qualitative researchers address study reliability by proving the trustworthiness and consistency of the research data and results (Elo et al., 2014). Reliability also refers to the replicability of the research process and results (Woolcock, 2013). Researchers can enhance the reliability of the research process and results through constant data comparison, refutational analysis, and comprehensive data use (Leung, 2015). Noble and Smith (2015) stated that the data should be complete, inclusive, accurate and verifiable in form and context. Researchers ensure reliability by minimizing errors and biases in the study (Singh, 2014).

Qualitative researchers align the concept of dependability with reliability (Yilmaz, 2013). Researchers address dependability to ensure study findings are consistent and repeatable (Anney, 2014; Houghton et al., 2013; Yin, 2014). In a qualitative inquiry, improving dependability includes conducting an audit trail, member checking of data interpretation, transcript review, and using an interview protocol (Yin, 2014).

Researchers use member checking to (a) verify the correctness of the data, (b) clarify and gather more information, and (c) allow participants to input into the study findings and conclusions (Harvey, 2015; Reilly, 2013). Fusch and Ness (2015) noted that reaching data saturation will also help to assure dependability of study findings. I developed and followed the interview protocol that included (a) an overview of the research study, (b) procedures for data collection, and (c) interview questions. I continued to interview

agribusiness managers until no new information, and no new themes emerged. I achieved data saturation after interviewing five agribusiness managers. I also ensured dependability by conducting member checking and transcript review. Participants had the opportunity to review transcripts to ensure there were no errors. By employing member checking, I was able to get feedback from participants on the correctness of the data and my interpretation of their responses.

Validity

Qualitative researchers must establish validity to ensure credibility and trustworthiness of the research methods (Baskarada, 2014). Validity refers to the credibility and truthfulness of the research tools, processes, data, and results (Leung, 2015). Validity is the degree to which the research is a true representation of the actual phenomenon and encompasses the four aspects of trustworthiness, credibility, authenticity, and transferability (Anney, 2014; Leedy & Ormrod, 2013).

Credibility refers to the extent to which research data and results are believable or trustworthy (Anney, 2014). To ensure credibility in a qualitative study, a researcher must establish the plausibility or believability of the research results from the perspective of the participants (Elo et al., 2014). Since the purpose of qualitative research involves gaining a detailed understanding of the phenomena from the participant's perspective, it is only the study participants who can legitimately judge the credibility of the research results (Singh, 2014). Strategies researchers use to establish credibility include (a) having a prolonged and varied field experience, (b) member checking of data interpretation, (c) triangulation, and (d) transcript review (Anney, 2014). I conducted transcript review to

verify the accuracy of the interview data and member checking to ascertain the correct interpretation of the participants' views. I collected data from examination of documents and semistructured interviews to corroborate the research findings and ensure credibility.

Confirmability in qualitative research refers to the extent to which the research data is a true representation of the participant's views (Elo et al., 2014). Confirmability is the researchers' potential congruence about the data's accuracy, meaning, or relevance (Noble & Smith, 2015). To ensure confirmability, researchers must reflect the participants' voice and not their perspectives or biases (Anney, 2014; Houghton et al., 2013). To assure confirmability, researchers use triangulation and engage in self-reflection to identify any biases that may influence data collection and analysis (Sherry, 2013). I used methodological triangulation to corroborate the research findings and document procedures for checking the data to ensure confirmability. For effective bias management, I conducted a personal assessment of biases that I had and maintained a reflective journal throughout the study.

Transferability refers to an adequate account of the research process and the extent to which research findings apply to other contexts or settings (Houghton et al., 2013; Reilly, 2013). Researchers can enable others to apply results of research to other settings by giving clear descriptions of the research context, characteristics of the participants, assumptions, and data collection and analysis processes (Byrne, 2013; Yin, 2014). Elo et al. (2014) noted that it is up to the reader to determine the transferability of the results to another context. Researchers can enhance transferability by documenting in detail data collection and analysis procedures and ensuring data saturation (Noble &

Smith, 2015; Singh, 2014; Yin, 2014). To assure transferability, I provided a robust description of the research context, characteristics of participants, assumptions, and data collection and analysis procedures. I reached data saturation after five interviews.

It is critical for researchers to demonstrate rigor and comprehensiveness in data collection (Guetterman, 2015). Researchers use data saturation to ensure collection of quality and adequate data (Marshall et al., 2013). A researcher reaches data saturation when no new perspectives or themes relating to the research question emerge with more interviews (Fusch & Ness, 2015; Marshall & Rossman, 2016). To ensure data saturation, I interviewed agribusiness managers until no perspectives or themes were no longer emerging with additional interviews.

Transition and Summary

Section 2 of the study included the purpose statement, the role of the researcher, research participants, research method and design, population and sampling, ethical research, and data collection instruments. Other elements of Section 2 included data collection and organization techniques, data analysis, and reliability and validity of the study. In Section 3, I presented the study findings, discussed the results and the application to professional practice, implications for social change, and provided recommendations for action and future research studies.

Section 3: Application to Professional Practice and Implications for Change

Section 3 of this study contains an introduction of the study and the presentation of the findings. Also, included in this section are the applications of my research to professional practice, implications for social change, and recommendations for action and further study. I concluded with my reflections of the experiences of the doctoral study journey and my conclusions.

Introduction

The purpose of this qualitative multiple case study was to explore the strategies agribusiness managers in the urban district of Harare, Zimbabwe use to prevent and mitigate the effects of disruptions in agro-food supply chains. I conducted in-depth interviews with five agribusiness managers from two agro-food companies who had (a) senior management positions and (b) experience in implementing successful strategies for preventing and mitigating the effects of disruptions in agro-food supply chains. Other sources of data included documents on company policy and operational procedures for managing disruptions, risk management plans, minutes, and business continuity plans. Based on the analysis of participants' responses to the interview questions and company documents, three themes emerged: (a) collaboration among supply chain partners, (b) business continuity management, and (c) the use of a multiple supplier base.

Presentation of the Findings

The overarching research question for this study was: What strategies do agribusiness managers use to prevent and mitigate the effects of disruptions in agro-food supply chains? I used semistructured interviews with open-ended questions to enable

participants to provide detailed information on effective strategies they used to prevent and mitigate the effects of disruptions in agro-food supply chains. I used NVivo 10 software to sort, code and analyze data. The three themes that emerged from the data were:

- Collaboration among supply chain partners
- Business continuity management
- Multiple supplier base

Theme 1: Collaboration among Supply Chain Partners

The first theme that emerged from the analyzed data was collaboration among supply chain partners. All the five participants stated that collaboration is an important strategy they use to prevent and mitigate the effects of disruptions in agro-food supply chains. P3C1 stated, "Collaboration among supply chain partners minimizes the effects of disruptions to the organization and to the supply chain as a whole." P1C1 said, "Collaboration with other supply chain partners is a key strategy we use because the effects of disruptions go beyond our company's context, to the whole supply chain." P5C2 mentioned, "When we collaborate with other supply chain partners, we are better able to deal with disruptions." The other two participants (P2C1, P4C2) noted that agribusiness managers engaged in collaborative efforts to cope with uncertainties and to minimize disruptive risk. P4C2 mentioned that by collaborating with other supply chain partners, managers can react to unexpected disruptive events. In their study, Zhu et al. (2016) reported that collaboration is an effective strategy business leaders use for mitigating the effects of supply chain disruptions. Similarly, Zhu, Krikke, Caniels, and

Wang (2017) indicated that the more collaborative links managers develop with their suppliers, distributors, and customers the better they can manage and minimize the impacts of supply chain disruptions. Swanson, Jin, Fawcett, and Fawcett (2017) also noted that managers seek for more integrative and collaborative efforts to cope with uncertainties, share costs, and minimize risks.

Participants from C1 and C2 elaborated on the type of collaboration they engaged in to prevent and mitigate the effects of supply chain disruptions in agro-food supply chains. Participants stated that agribusiness managers collaborated with other supply chain partners to facilitate information sharing, synchronized decision making, and recovery assistance. According to P1C1, P2C1, P4C2, and P5C2, information sharing was essential to supply chain collaboration and helped to reduce risks in the supply chain. P1C1 described information sharing as the "heart" of supply chain collaboration. P5C2 said, "It is important to share relevant information across the supply chain because certain decisions, for example, order decisions can be made on real time information." P4C2 stated, "When we share information, it gives us the opportunity to resolve problems jointly and implement best practices for identifying and managing risks." P2C1 mentioned, "Information sharing allows us to monitor the movement of products across the whole supply chain and fulfill demand more quickly." Kembro and Naslund (2014) deduced that comprehensive information sharing leads to exposure of new ideas, risk reduction, and enhanced coordination of the supply chain. In another research, Teller et al. (2016) observed that through information sharing, managers are able to maintain tighter vertical integration of the supply chain and minimize the effects of disruptions.

Sharing information is valuable to managers and it can have a great impact on planning efficiency and performance of the supply chain.

Participants (P2C1, P3C1, and P4C2) described the types of information they shared with other supply chain partners. P2C1 stated, "We share information on short-term forecasts, market trends, and delivery schedules. This helps us to reduce our inventory levels and eliminate stock-outs." P4C2 mentioned "We collaborate with other internal teams in the supply chain to get a full sight of the inventory levels and reorder points. We are then able to proactively adjust to evolving supply demands." P3C1 provided more information on the processes they use to prevent and minimize effects of disruptions in their supply chain.

We share information on production schedules, order status, and delays in lead time. Through collaboration, we can respond and manage risks as a group rather than having to manage the issues in isolation. We save time and reach mutually beneficial decisions. Quick dissemination of information helps us to respond to disruptions quickly.

Based on the data analysis, agribusiness managers can minimize the effects of disruptions by sharing information across the agro-food supply chain. Through information sharing, managers can understand the bigger picture, track key performance variables, and mitigate risk in the supply chain. Business managers should establish information sharing-based partnerships to maximize learning opportunities, develop new competencies, and minimize the risk of business interruption.

I reviewed C1's and C2's operations and procedures manual and the minutes of meetings with other supply chain partners. Participants' statements on collaboration through information sharing corroborated with information contained in C1's and C2's operations and procedures manual. An excerpt from C1's operations and procedures manual states,

In order to develop and choose appropriate capabilities to cope with risk and uncertainty, the organization will require information about its environment, possible disasters and the operations of its upstream and downstream supply chain partners. It is the responsibility of the Operations Department to coordinate and share relevant information with the organization's supply chain partners to help improve the supply chain transparency and visibility. The information will include forecasts on market demand, inventory levels, logistics information, and delivery schedules. However, from time to time, the Operations Director will determine other additional information sharing requirements.

I also reviewed minutes of C1 and C2's planning meetings with supply chain partners and observed that the information shared among the supply chain partners include short-term forecasts on product demand, production and delivery schedules, market trends, and inventory and order status. Specific information shared on inventory included inventory levels, holding costs, backlog costs, and service levels. On order status, both C1 and C2 shared information on demand, demand variance, order batch size, and order due date. By sharing order status, managers can improve the quality of customer service and reduce payment cycles.

In assessing barriers to supply chain collaboration, participants from C1 indicated that sharing the benefits of collaboration could be a contentious issue where more powerful and bigger firms tend to benefit more than smaller companies. P4C2 stated "Compensation and incentive structures may not always encourage collaboration. Also, information hoarding and low trust by some supply chain partners are some of the barriers we encounter in our collaboration efforts." P5C2 attributed the difficulty of implementing supply chain collaboration to the inflexibility of organizational processes, lack of a shared vision, differences in technological capabilities among supply chain partners, and lack of management support.

Participants' statements highlighting why collaboration can fail are consistent with other authors' observations in literature. In a qualitative multiple case study of 15 companies, Fawcett et al. (2015) observed that cross-functional conflicts, strategic misalignment, poor systems connectivity, information hoarding, low trust, and resistant to change can lead to a lack of collaboration among supply chain partners. In another study, Soosay and Hyland (2015) identified the high cost of sharing information, low level of trust among supply chain partners, a disparity in technological capability among supply chain partners, and lack of top management support as major obstacles to effective supply chain collaboration. Such constraints may lead to a lack of well-aligned goals within the supply chain. Therefore, managers should nurture interorganizational relationships and manage conflicting interests for effective collaboration.

When asked, what strategies were effective in addressing the barriers to supply chain collaboration, participants from C1 and C2 stated that building relationships

between collaborating firms, a collaborative culture, and use of information technology resources were crucial to successful collaboration. P2C1 stated, "Having a collaborative culture and an orientation towards relation building with supply chain partners creates an environment of mutual benefit." P3C1 and P4C2 mentioned that managers can enhance collaboration by using internet-based tools for information sharing. The finding that building interorganizational relationships between collaborating firms have a major role in enhancing supply chain collaboration is similar to Teller et al. (2016) findings. The researchers found that by having well-maintained relationships with supply chain partners, managers could (a) access reliable information about pending disruptions, (b) improve access to essential resources, and (c) plan effectively with other supply chain partners to improve supply chain responsiveness.

The finding that collaboration among supply chain partners minimized the effects of disruptions in agro-food supply chains aligned with the findings presented by Van de Ven and Drazin (1985) in explaining the CTF. According to Van de Ven and Drazin (1985), a supply chain disruption is a lack of fit. Van de Ven and Drazin also noted that there is a no one-size-fits-all strategy to manage uncertainties and risks, but the appropriateness of a mitigation strategy is dependent upon the internal and external environment. The effect of a supply chain disruption is minimal when a firm can organize efficient responses (Grotsch et al., 2013). In applying the CTF principles, business managers can design and deploy collaborative responses to prevent and minimize the effects of supply chain disruptions (Sheffi, 2015). The participants attested to collaborating with other supply chain partners to facilitate information sharing, decision

making, and recovery assistance. Because of the interconnectedness of the supply chain, managers can share information and collaborate on mitigating risks and uncertainty.

Theme 2: Business Continuity Management

The second theme that emerged from analyzing the participants' responses was business continuity management. Participants articulated that by having contingency measures or business continuity plans in place, managers can mitigate the effects of disruptions and ensure business continuity. P2C1 stated, "With a contingency plan, you are not caught off guard." P3C1 remarked, "Having a contingency plan is an additional way of mitigating risk of damage to your company and the supply chain as a whole. Contiero, Ponsignon, Smart, and Vinelli (2016) also noted that managers put in place contingency measures to minimize potential loss from disruptions. The participants shared two contingency measures they employ to prevent and mitigate the effects of disruptions in agro-food supply chains. The two contingency measures are insurance and holding a strategic safety stock.

Insurance. All the five participants confirmed having taken insurance for their companies against risks that include fire, flooding, vandalism, and severe weather. Participants (P1C1, P2C1, P3C1, and P5C2) mentioned that the nature of the potential of the supply chain risk was critical in selecting an appropriate mitigation strategy. P5C2 said, "Catastrophic events such as fire or flooding have the potential to damage physical facilities and interrupt production. They can, therefore, affect business continuity. Buying insurance can minimize the damage caused by these unforeseen events." P2C1 stated, "We have taken insurance in our business because an insurance cover helps to minimize

the financial effects of both daily supply chain risks and catastrophic disruptions." P3C1 noted that by pairing a financial-based mitigation strategy like insurance with other operation-based mitigation tactics, for example, collaboration and multi-sourcing, managers can protect their supply chains as well as their firms' bottom lines. Participants' statements highlighting insurance as an important contingency measure for preventing and mitigating the effects of disruptions are consistent with other authors' observations in literature. Eastburn and Sharland (2017) asserted that insurance provision helps managers to minimize the effects of supply chain disruptions and to survive shocks. Kobayashi (2017) explained that insurance is the primary mechanism organizational leaders use to secure funds to recover from losses following catastrophic hazards and managers can elect to guard against such catastrophic hazards by paying an insurance premium.

The participants (P1C1, P3C1, and P4C2) stated that an insurance solution can mitigate a wide range of risks that include (a) property damage as a result of a catastrophic disaster, (b) insolvency of suppliers, (c) lost or damaged cargo, and (d) lost sales due to labor strikes. P1C1 stated,

When we buy insurance, it covers our losses and reduces the amount of money we need to recover from enormous damages, and it reinforces our investment. We had a fire incident a few years ago, and the fire damaged the whole left wing of our production facility. From the insurance payments, we were able to replace lost income and the damaged property, and we, therefore, recovered quickly.

The participants' statements aligned with information contained in the two companies' continuity business plans. A review of C1's and C2's business continuity plans showed

that insurance was part of the firms' incidence response and recovery plans. I also reviewed C1's insurance policy document and noted that the company has insurance for business interruption as part of property insurance. The insurance covers (a) C1's net profits in the event that the property is destroyed, (b) operating costs that include wages and mortgage costs during business shut down, (c) lost revenue due to labor strikes, (d) utility service interruptions, and (e) insolvency of suppliers. By purchasing insurance, managers can reduce the financial impact of disruptions to the business and the supply chain. Kumar et al. (2014) described insurance as an optimal primary risk mitigation strategy to guard against company closure in the event of a catastrophic disaster. In support of Kumar et al.'s findings, Chang et al. (2015) contended that in high severity risk contexts, buying insurance is a better strategy for minimizing the effects of disruptions.

Strategic safety stock. All the participants (P1C1, P2C1, P3C1, P4C2, and P5C2) believed that maintaining a strategic safety stock is an important contingency measure to guard against external resource shortages. The participants indicated that they held strategic reserve stocks for critical components in their companies to manage supply and avoid stock outs. P1C1 stated, "In our organization, we hold a strategic safety stock to mitigate the effects of supply chain disruptions." P2C1 said, "We focus on holding inventory for critical ingredients for some of the products we manufacture. The ingredients are not available locally, and we have to import them." When asked what processes they used to minimize the effects of agro-food supply disruptions, P4C2 stated,

To avoid stock outs, we maintain an inventory buffer of critical elements, especially the ones which are not available locally. We have to source them from

outside the country. We need to get an import license and apply for foreign currency. We also experience long delays at the border. It takes us about 4-6 weeks before we get the products.

The participants' statements aligned with the information contained in the inventory policy documents. C1 and C2's inventory policy documents showed that each company required an inventory stock cover of no less than 6-8 weeks. Business managers maintain strategic safety stocks to mitigate the risk of stock outs. However, there is need for managers to find the right balance between high holding costs of inventory and too little stock that can lead to lost sales.

Participants' assessments of the effectiveness of holding a strategic safety stock included (a) the ability to adapt to market variations more efficiently, (b) adapting to consumer demand more quickly, and (c) containing costs. P3C1 and P5C2 described the need to respond to market demand variations more efficiently while controlling supply chain operational costs. Four of the participants (P1C1, P2C1, P3C1, and P5C2) indicated that stock outs were expensive because their industry was highly competitive and consumers of the products exhibited limited brand loyalty. P3C1 declared, "Stock outs can lead to lost sales and loss of customer goodwill." Given the potentially unpleasant consequences of stock outs, managers should adopt a systematic approach to managing inventory to meet variations in the supply of raw materials and consumer demand.

Participants' statements highlighting the need to hold a strategic safety stock for critical components are consistent with other authors' observations in literature. Hoberg, Protopappa-Sieke, and Steinker (2017) asserted that strategic safety stock should have

highly critical components because of the costs associated with holding inventory. Rajesh et al. (2015) and Salam, Panahifar, and Byrne (2016) explained that having an inventory buffer makes economic sense if the parts are critical, unique, and come from a single source. A strategic safety stock can serve as an insurance against stock outs. However, managers should strike a balance between inventory costs and a desired customer service level.

Theme 3: Multiple Supplier Base

The third theme that emerged from the analyzed data was the use of a multiple supplier base. All the five participants stated that having a multiple supplier base is an important strategy they use for preventing and minimizing the effects of supply-side disruptions. P1C1 said, "In our company, we source from different suppliers to hedge against supply failure by some of our vendors." P2C1 stated,

Sourcing from different suppliers gives us more flexibility to respond to unexpected events and risks of supply chain disruptions. With multiple sourcing, we can switch from a defaulting supplier to other vendors who already supply the company. Multiple sourcing gives us a variety of options and helps us to maintain a level of competition among suppliers. As a result, we get a better quality of service and competitive price.

P5C2 endorsed the sentiments of P2C1 by stating, "Sourcing from a single supplier can expose a firm to a greater risk of supply interruption. By using multiple sourcing, we get the chance to pick the best suppliers, have timely deliveries and source at a lower price."

The participants also noted that by sourcing from multiple suppliers, managers have

greater assurance of timely delivery and increased flexibility in getting firm requirements from diversified sources.

P3C1 and P4C2 indicated they used a multiple supplier base to increase flexibility even though they may not attain the lowest price. In assessing the barriers to implementing a multiple supplier base, the participants indicated the high cost involved in managing many suppliers. P4C2 stated, "Managing more than one supplier is cumbersome." Responding to Interview Question 4 on addressing the barriers, participants (P2C1, P3C1, and P5C2) indicated they were now integrating technology based applications into their management systems to manage the diverse suppliers closely and streamline supply chain processes to reduce procurement costs.

Most participants shared that managers need to focus on supplier relationships in managing a multiple supplier base. Four of the participants (P2C1, P3C1, P4C2, and P5C2), indicated that management of supplier relationships was critical because managers can plan effectively and improve supply chain responsiveness. P3C1 and P5C2 were of the view that healthy relationships depend partly on selecting the right supply chain partners. P3C1 stated,

Supplier relationship management is crucial for improving a company's responsiveness to supply disruption. We have established a good relationship with our suppliers to ensure mutual understanding and commitment so that we can resolve issues quickly. As a first step, we place emphases on the risk that pertain to suppliers, by selecting the right type of providers. If a vendor is unable to meet

delivery time and quality standards, it affects the company's production and consequently customer fulfillment.

P3C1's assertion aligned with Cagnin et al.'s (2016) statement that managers should identify the potential risks that the suppliers may offer to the organization to avoid any interruptions to supply. Therefore, having an established criteria for selecting suppliers that takes risk into account is important in mitigating the firm's risk.

The participants (P2C1, P3C1, P4C2, and P5C2) confirmed they had established criteria for selecting suppliers. P5C2 said, "We select our suppliers on the basis of price, quality, production capacity, reputation, and the risk of on-time delivery." P5C2's statement was consistent with the information contained in C2's procurement policy and procedures manual. The procurement policy and procedures manual had information on the process of identifying suitable suppliers, evaluation of bid submissions, and monitoring of supplier performance. An excerpt from C2's procurement policy and procedures manual states,

Selection of suppliers shall be coordinated through the Tender Committee and tender submissions shall be solicited by advertising. The tender evaluation criteria shall address, but not limited to (a) product and service quality, (b) cost, (c) production capacity, (d) ability to meet specification and standards (e) reputation, (f) risk of on-time delivery, (g) agility, and (h) financial stability and credit strength. The committee shall score the tender proposals using a separate sheet for each submitted bid. The Chairman of the committee shall identify and shortlist qualifying suppliers based on the overall score during the tender review process.

The final selection will be made after the committee has organized site visits with the potential suppliers and assessed how each business operates.

In awarding tenders, the committee also considers the supplier's past performance, financial and technical resources, and accessibility to other resources.

Participants shared that in managing a multiple supplier base, they strive to (a) establish a good working relationship with their suppliers and (b) improve their suppliers' performance. Participants P3C1 and P4C2 confirmed having open communication with suppliers to build trust and confidence. P3C1 said, "We share information and have established open communication with our suppliers and as a result, we have secured their commitment and trust." Durach et al. (2015) asserted that in buyer-supplier relationships, trust and communication are critical elements of a good working relationship. In their study, Revilla and Knoppen (2015) found that effective communication, trust, and knowledge and information sharing could result in more transparent buyer-supplier relationships. The participants also stated that C1 and C2 had supplier development programs. P4C2 stated, "We share information and assist suppliers to improve their performance. We also have a supplier development program to help our suppliers improve their processes, skills, and capabilities. P2C1 mentioned, "It is in our best interest to have a capable supplier network. We build the capacity of our suppliers to serve our organization more effectively thereby improving the bottom line in the long term." Agribusiness managers can focus on supplier development and establishing transparent buyer relationships to increase the organization's sustainability in the market

place. Business leaders may use supplier relationship management to minimize the risk of business interruption and improve supply chain performance.

Research findings from literature support the study results that the use of a multiple supplier base strategy prevented and minimized the effects of agro-food supply chain disruptions. Jensen (2017) found that the use of multiple suppliers serves as a buffer against supply disruption risk. Similarly, Tsai (2016) found that managers source from multiple suppliers to get the assurance of timely delivery and to prevent the disruption of supplies due to unforeseen risks. In their study, Rajesh et al. (2015) found that business managers diversify order quantities and hedge against the sudden demise of a single supplier by having multiple competing suppliers. By using multisourcing options, managers can prevent disruptions and maintain profitability and effective operations.

The CTF served as the conceptual framework for this study. Van de Ven and Drazin (1985) opined that optimal decisions within a firm are contingent upon the internal and external issues and the company's performance depends on how well organizational resources match the business environment. Purchasing items from different suppliers is an insurance against disruption risk (Jensen, 2017). In applying the CTF principles, managers can mitigate the negative impact of supply failure by optimizing order allocations among multiple suppliers. Because of increasing customer demands, competition, and risk in the global environment, organizational leaders are putting more effort in nurturing their supply chain and the supplier selection process (Cagnin et al., 2016). In terms of the CTF, managers can maximize company

performance by selecting suppliers that meet their organizational needs within the prevailing internal and external business environment context.

Applications to Professional Practice

An efficient and competitive agro-food supply chain can lead to competitive advantage and success in food security issues (Anastasiadis & Poole, 2015). However, agro-food supply chains are prone to disruptions due to their size, complexity, and dynamic nature (Chang et al., 2015). Supply chain disruptions can result in production and product quality problems, loss of revenue, reduced brand value, and erosion of customer loyalty (Chakravarty, 2013). Implementing successful mitigation strategies results in organizations having lower costs and improved profitability (Wright & Datskovska, 2013). Identifying strategies agribusiness managers use to prevent and mitigate the effects of disruptions may lead to improvements in business performance and sustainability.

I conducted a qualitative multiple case study to explore the strategies agribusiness managers use to prevent and mitigate the effects of disruptions in the agro-food supply chains. Based on the data collected, all participants had implemented successful strategies for preventing and mitigating the effects of disruptions in agro-food supply chains. Three themes emerged from the data: (a) collaboration among supply chain partners, (b) business continuity management, and (c) use of a multiple supplier base. The findings from this study could contribute to improving business practice by providing information that can reduce effects of disruptions in agro-food supply chains, as well as raise

agribusiness managers' awareness and understanding of strategies for preventing and mitigating the effects of disruptions in agro-food supply chains.

Based on participants' feedback, collaboration with other supply chain partners was among the important business practices agribusiness managers are currently implementing to prevent and mitigate the effects of agro-food supply disruptions. MacCarthy et al. (2016) asserted that supply chain competitiveness is a result of cooperation, collaboration, and coordination among supply chain partners. Managers seek for more integrative and collaborative efforts to cope with high demand uncertainties and to share costs and risks (Kache & Seuring, 2014). The participants attested collaborating with other supply chain partners to facilitate information sharing, decision making, and recovery assistance. The findings of this study may help agribusiness managers to bridge the knowledge gap on collaborative mechanisms that help minimize the effects of supply chain disruptions.

Agribusiness managers could use the findings from this study to implement risk mitigation strategies that include business continuity management and using a multiple supplier base. Supply chain practitioners in the agro-food industry could also use the findings to explore the potential causes of disruptions in agro-food supply chains and develop principles to improve supply chain sustainability and performance. The study findings and recommendations might contribute to existing and future research, and close gaps in business practice regarding strategies agribusiness managers use to prevent and mitigate the effects of supply chain disruptions in agro-food supply chains. Additionally, the findings of this study may also add to the body of knowledge on topics such as

sources of risk in agro-food supply chains, effects of supply chain disruptions, prevention and mitigation strategies, and agro-food supply chain competitiveness.

Implications for Social Change

Agro-food supply chains are increasingly becoming complex and vulnerable to disruptions (Chang et al., 2015). Business managers who manage disruption risk can improve the performance and competitiveness of their businesses and deliver the best value to their customers (Tse et al., 2016). Leaders of successful businesses contribute effectively to the improvement of human and social conditions by creating jobs, participating in environmental sustainability programs, and contributing to economic growth (Polonsky et al., 2016). The findings of this study could contribute to positive social change by providing information on strategies for reducing supply chain costs. A reduction in supply chain cost may lead to lower prices of agro-food products to consumers which could lead to an improvement in the lives of consumers. Managers could also improve the standard of living for customers with lower incomes because of the reduction in costs.

Supply chain risks in the agro-food industry may result in recalls and have a negative effect on company performance (Chaudhuri et al., 2016). With improved knowledge, agribusiness managers can implement mitigation strategies that may lead to better products and reduced recalls. Consumers may benefit through the provision of better services and good quality products. The study findings may also influence policy and decision makers in Zimbabwe and other southern African countries.

Recommendations for Action

Agro-food supply chains are prone to costly disruptions, and it is critical for business managers to assess the supply chain risks and develop effective mitigation strategies (Chaudhuri et al., 2016). The business problem addressed in this study was that some agribusiness managers have limited strategies to prevent and mitigate the effects of disruptions in the agro-food supply chains. The results of this study revealed that agribusiness managers could use a variety of strategies successfully to prevent and mitigate the effects of disruptions in agro-food supply chains. Based on the findings from this study, I recommend that agribusiness managers adopt a systematic approach to mitigating disruption risk in agro-food supply chains. The process should involve assessing the risk sources and the impact of the risk, tracking the risk drivers, and selecting an appropriate strategy based on the level of uncertainty and risk.

Communication and information sharing are critical factors for successful collaborative relationships. Participants in this study noted that some supply chain partners might not share information because of the low level of trust. I recommend that agribusiness managers establish strong lines of communication with supply chain partners to facilitate information flow and more transparent buyer-supplier relationships. Furthermore, I recommend that agribusiness managers make use of e-collaboration tools, for example, asynchronous conferencing and web-based chat tools to improve communication abilities in the agro-food supply chain. Additionally, I recommend agribusiness managers and supply chain practitioners invest in supplier development programs and focus on measuring and rewarding supplier performance and continuous

improvement of the whole supply chain. Through supplier reward or recognition programs managers can motivate their suppliers to perform better in terms of quality, pricing, and delivery commitments, and also improve supplier loyalty and commitment.

Based on participants' feedback, business managers experience long delays in clearing their imported goods due to bureaucratic procedures at the border. I recommend that policy makers implement a policy framework that supports importers of critical materials. The government should simplify border procedures and consider coming up with an import priority list where it can give priority in the allocation of foreign currency to the importation of essential goods and services. The findings and recommendations of this study are relevant to organizational leaders, agribusiness managers, supply chain practitioners, researchers, and scholars. I will disseminate the research results to various stakeholder groups at conferences, training seminars, and professional development workshops. I will also share the findings through publication in scholarly and business journals.

Recommendations for Further Research

The aim of this study was to explore the strategies agribusiness managers use to prevent and mitigate the effects of disruptions in agro-food supply chains. I used an exploratory qualitative multiple case study design involving semi-structured interviews. The research was specific to agribusiness managers located in the urban district of Harare in Zimbabwe. Future researchers may explore other research methods, quantitative or mixed methods. The mixed methods approach involves combining statistical analyses of numerical data and thematic data (Sparkes, 2014). Future researchers can also use a

quantitative correlation design to examine the performance rate of each strategy in preventing and minimizing effects of agro-food supply disruptions. An additional area of research is determining the relationship between the various mitigation strategies and supply chain performance. Supply chain disruptions affect many industries. However, the focus of this study was on the agro-food sector. Future studies can focus on other geographic areas and other industries.

Another limitation of this study was the use of a small sample of five agribusiness managers. Boddy (2016) noted that the utilization of a larger sample might have a different result. Future research can include a larger sample from other developing countries in the South African region. Conducting further research on a wider scale on prevention and mitigation strategies would add to the knowledge base of strategies for preventing and mitigating the effects of disruptions in agro-food supply chains.

Reflections

My goal in conducting the qualitative multiple case study was to build my competence in qualitative research while researching on a subject that I had an active interest in. As a consultant in the agro-food sector, I was mindful of my biases throughout the study. I focused on capturing the views and perspectives of participants in an unbiased manner. Getting through the literature review was most overwhelming for me. However, it was a valuable exercise because I was able to build a logical framework for my research and add support to the research topic.

During fieldwork, I received cooperation from the five agribusiness managers I interviewed. The study participants gave candid responses to the interview questions, and

I gained detailed understanding and in-depth knowledge of the research problem. Coding and developing of themes during data analysis was not as easy as I thought but I gained valuable skills I will use in my consultancy work. Reflecting on the results of the study, I was able to dispel my preconceptions and beliefs. I found that while collaboration among supply chain partners is an effective strategy for preventing and mitigating disruptions in agro-food supply chains, it is not easy to achieve. Collaboration can fail due to low trust, information hoarding, strategic misalignment, and poor system connectivity. I can now view the research problem through the lenses of five agribusiness managers. Overall, the DBA journey was an extremely rewarding process for me.

Conclusion

The findings from the qualitative, multicase study revealed that agribusiness managers could prevent and mitigate the effects of disruptions in agro-food supply chains by collaborating with other supply chain partners, putting in place business continuity measures, and using a multiple supplier base. Agribusiness managers must first understand the sources of disruption risk, assess the impact of the risk, and then select an appropriate strategy based on the level of uncertainty and risk. The findings of this study also revealed that by applying the strategies that emerged from the participants' responses, agribusiness managers can improve supply chain sustainability and performance.

The inherent disruption risks in agro-food supply chains and associated costs are of concern to most organizational leaders. By managing the risks effectively, managers can improve the performance and competitiveness of their businesses. I recommend that

agribusiness managers, supply chain practitioners, researchers, and scholars use the findings and recommendations of this study to gain new insights on strategies for preventing and mitigating the effects of disruptions in agro-food supply chains.

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Appendix A: Certificate of Completion – National Institutes of Health



Appendix B: Letter of Cooperation

17 June, 2017

Dear Everjoyce,

You have the permission to conduct the study entitled: *Strategies for Preventing and Mitigating the effects of Agro-food Supply Chain Disruptions* within our company. As part of this study, I authorize you to contact participants and collect data through semi-structured interviews, collect company documents from participants, conduct member checking, and results dissemination activities. Individuals' participation will be voluntary and at their own discretion. The use of company documents will be subject to the terms and conditions outlined in the Data Use Agreement.

We understand that there are no costs that will be incurred by our organization or individual participants. We also understand that our organization's responsibilities include the fact that we reserve the right to withdraw from the study at any time if our circumstances change.

I confirm that I am authorized to approve research in this setting and that this plan complies with the organization's policies.

I understand that individual responses will be recorded for analysis and reported with no information that identifies the participant or the organization. I also understand that the data collected will remain confidential and may not be provided to anyone outside of the student's supervising faculty/staff without permission from the Walden University IRB.

I wish you the best with your research.

Sincerely,

MANAGING DIRECTOR

Appendix C: Invitation Letter to Potential Participants

Dear Agribusiness Manager,

My name I am Everjoyce Muzvondiwa, a student at Walden University pursuing a doctoral degree in Business Administration. I am inviting you to participate in the study titled: *Strategies for Preventing and Mitigating the Effects of Agro-food Supply Chain Disruptions*.

You have been chosen to participate in this study because you are (a) at least 18 years old, (b) serving as a senior agribusiness manager, (c) able to provide rich information on agro-food supply chain disruptions, and (d) have implemented successful strategies for preventing and mitigating the effects of disruptions in agro-food supply chains. The purpose of this case study is to explore the strategies agribusiness managers use to prevent and mitigate the effects of disruptions in the agro-food supply chains. The contribution to positive social change may include a reduction in supply chain costs, provision of better services and products to consumers, and lower prices of agro-food products to consumers which consequently can lead to an improvement in the lives of consumers.

I am seeking your concurrence to conduct face-to-face semistructured interviews with you for the purpose of collecting research data for the doctoral study. Attached to this invitation letter is a consent form containing more detailed information on the research procedures, sample interview questions, the voluntary nature of the study, risks and benefits of the study, and confidential and safety procedures. Take time to review the consent form which you will need to sign and hand it to me before the beginning of the

interview. If you agree to participate in this study, I kindly request you to respond by email to Everjoyce. muzvondiwa@waldenu.edu indicating your agreement. You may also contact me on XXXXXXXXXXXX in case you have any study related questions. Thank you in advance for your cooperation and support.

Sincerely,

Everjoyce Muzvondiwa

Doctoral Candidate, Walden University

Appendix D: Interview Protocol

Introductory Notes to the Interview

My name is Everjoyce Muzvondiwa, a student at Walden University pursuing a doctoral degree in Business Administration with a specialization in Global Supply Chain Management. Thank you for accepting to participate in this study. I am conducting a qualitative multiple case study titled: *Strategies for Preventing and Mitigating the Effects of Agro-food Supply Chain Disruptions*. The purpose of this case study is to explore the strategies agribusiness managers use to prevent and mitigate the effects of disruptions in the agro-food supply chains. The duration of this interview should be about 30-45 minutes. The interview format is open ended questions. Please feel free to seek clarity to questions, and add more detailed explanations and personal views as you see appropriate.

Things to remember

- Switch off the mobile phone
- Collect the signed consent form
- Get approval to record the interview
- Assure participant that all responses will be confidential
- Start interview and take notes
- Observe the participant for non-verbal body language and gestures
- Elicit detailed responses to the interview questions
- Not to interrupt the participants and to listen carefully what they are saying (active listening)
- Ask follow-up probing questions to get more in-depth information

- Advise participant that they will receive by email a copy of the transcribed interpretation of the audio recording. They will need to review for accuracy, give feedback, and then sign the document, and return it.
- Thank the participant(s) for taking part in the study. Give participants contact numbers in case they have follow up questions and concerns.

Interview Questions

1. What strategies do you use to prevent disruptions in agro-food supply chains?
2. What strategies are most effective in mitigating the effects of disruptions in agro-food supply chains?
3. What barriers did you encounter in implementing the strategies for preventing disruptions to your supply chain network?
4. How did you address the barriers to the implementation of strategies for preventing disruptions to your supply chain network?
5. What processes do you use to minimize agro-food supply disruptions?
6. How do you assess the effectiveness of the strategies you use to prevent and mitigate the effects of supply chain disruptions?
7. What additional information can you provide on strategies to prevent and mitigate the effects of disruptions in agro-food supply chains?